FOOD INDUSTRIES

manufacturing and processing

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The Southern Hemisphere Is Stepping Out

THE NEWS of the first commercial shipment of Chilean oranges to the United States in August should cause thinking men to consider its exact significance, and should awaken them to the probability of great changes in the world markets for fresh, canned and preserved foods in the coming years. The Chilean orange shipment is merely symptomatic of what probably will follow, for in its broadest aspects the problem is not merely one of oranges but involves the produce of the whole Southern Hemisphere. Below are presented a few of the facts. The conclusions to be drawn from them are very evident.

Chile, with a length equivalent to the distance from Point Barrow, Alaska, to Mexico City, has about every form of cold, temperate and sub-tropical climate. The valley in which Santiago is situated is one of the garden spots of the world. For years Chile has enjoyed an export tax on nitrate—a source of revenue that is not so good today as it was five years ago. Chile is endeavoring to develop other forms of profitable enterprise.

Like all countries of the Southern Hemisphere, the seasons are the opposite of those of Northern countries. Countries so located should be able to produce and export the fresh foods that in Northern countries are either preserved, hothouse, or out-of-season products.

Refrigerator transport-service is available on nearly all of the trans-oceanic steamship routes. All that are lacking in many of the producing countries of the Southern Hemisphere are proper interior transportation facilities, precooling plants and cold-storage warehouses at the docks.

South Africa enjoys many of the same climatic benefits that are found in Chile, Argentina, California, and Florida. It has been called another California. A canning industry is developing in the vicinity of Port Elizabeth, with the technical aid of Americans, and American trained natives, that has the backing of such able men as A. Schlesinger, well known in London and Africa for his huge enterprises, particularly in the diamond field.

South America has already captured the major world markets for corned beef to so large an extent that corned-beef departments in some Chicago packing plants are virtually idle, when a few years ago they were very busy. One packer who produces corned-beef hash, among many other items, imports the corned beef from South America in 10-pound tins, cuts them open and repacks it as hash at a greater profit than would be possible by corning the beef at Chicago.

What will the future bring forth?

Sliced Bread

DURING the past twelvemonth the commercial bakers have evinced much interest in the sale of bread sliced at the bake shop. In practice, the loaf is run through a gang of knives set a half inch apart, placed on a supporting tray of stiff paper, and then wrapped by machine in customary fashion.

This novel method of merchandising the staff of life has gained its principal headway in the Middle West, and has proved to be a remarkable business getter for the baker who first employs it. Logically, it would seem that when all bakers are slicing bread—if such should be the case—no particular advantage will accrue to any one of them, unless the new idea should result in an increased per capita consumption of bread. It is asserted that such an increase in consumption has been demonstrated by field surveys, but it is still too early to pass definitely upon that point.

Technically, sliced bread has in its favor the somewhat equivocal virtue of apparent greater freshness than an unsliced loaf of the same baking. This is because of the greatly increased pliability of a crust that has been cut into many fragments. As a matter of fact, the moisture content of the two loaves may vary by as much as 8 per cent. Obviously, the baking technicians must bear in mind the possibility of unfavorable reaction when the housewife realizes that the apparently greater freshness of the sliced loaf is in part, at least, offset by a very substantially lowered moisture content.

Another technical point is that of the greater liability of the sliced loaf to mold, and the development of "rope," both of which have appeared in the past summer season in shops where slicing is being done. Clearly, it is no great cause for wonderment that trouble due to microorganisms should appear, in view of the fact that a loaf of bread, practically sterile as it leaves the oven and with no unprotected crumb surface, is sliced by knives that may well be infected with mold or rope spores, the superficial area of crumb surface being increased materially during the process. Prevention of contamina-

tion seems to depend on aseptic conditions in the slicing and wrapping rooms, conditions that are more characteristic of hospitals than of bake shops.

Bakers are being counselled by their technical advisers to use for slicing none but loaves made from doughs that are put together with a minimum of water. This is diametrically opposed to what has been the prevailing thought in the baking industry for many years and should tend to delimit the spread of the new merchandising idea among those who are accustomed to the present type of commercial bread.

Speaking generally, the extra expense incurred by slicing in the average commercial bakery is from one-half to three-quarters of a cent a loaf. Many bakers seek to get one cent more for their sliced loaves than for the same grade of bread unsliced, whereas others are making no price advance but, instead, are cutting two ounces from the scaling weight of the loaf.

To many of the larger bakers, as well as to those who are concerned with the welfare of the baking industry but are not commercial bakers, it is difficult indeed to visualize any lasting benefit to the industry by virtue of this mechanical slicing of the loaf. It probably will run its course, very much as any novel advertising idea has a habit of doing, and disappear—with the possible proviso that there may remain a specialty trade in sliced bread, attuned to the needs of the relatively few who may profit thereby.

Economic Postulates in Reverse

ADMITTING that the present age is one characterized by disconcerting paradoxes in the realms of physics and other natural sciences, it is by no means apparent that the basic laws of economics have been abrogated or altered in any essential manner. In consequence, when one hears or reads statements to the effect that "you cannot increase the consumption of a food by lowering its price," one should be on guard against too implicit acceptance of the claim and of all that follows in its train. The fact of the matter is that lowered prices for food tend to increase consumption, as they have done from time immemorial, up to, but not beyond, the point of satiation; and no amount of wishing that it were not so will diminish the verity of this fundamental economic law.

Often those who plead for this non-economic theory do so with the best of intent and for the most worthy of products, which makes all the greater the need for clear thinking and dispassionate judgment. Invariably they buttress their contention with statistical data of one sort or another and seldom do they differentiate between cause and effect when rising prices are involved. For example, to say that we refuse to eat corn meal as freely as was once the case is to recite a simple truth, but to say that this is so because corn meal is relatively cheap is to give as the reason therefor a coincident happening that may well be the result, rather than the cause.

Perhaps the truth is that our Southern neighbors are buying the more expensive wheat flour simply to show that they can afford it; buying for "swank," as it is sometimes termed. Perchance they really like bread better than corn pones. Possibly we have passed the dietetic stage of development—Europe never reached it—in which corn meal is to be regarded as a food, as contrasted with a feed. At any rate, it would be a bold economist who would argue that the low price of this excellent foodstuff is the sole cause of its unpopularity.

Equally apposite is the need for caution in accepting without reservation arguments built upon the recent history of the white potato. This carbohydrate is a virtual essential in a diet that is largely acid in the ultimate stages of digestion. It can be supplanted by other alkaline foods but not by cereals or the products thereof, all of which are similarly acid. It is a cause of no wonder to any dietitian that we grumble when the price of potatoes goes up. It is equally clear dietetically that when the point of alkaline-acid balance has been reached, no lowering of prices can increase individual consumption—barring such tragic instances as occasional dearth of practically all other forms of carbohydrate, as was once the case in Ireland.

When discussing dairy products the confusion between cause and effect, or cause and coincident happening, is all too manifest. As a matter of fact, we do consume more dairy products than we did in days gone by, and milk costs more than formerly was the case. All very true; but to add an explanatory clause to the effect that when milk costs more it is regarded as worth more, and consequently consumed in greater quantity is to distort matters sadly. Anyone who has watched the death rate of metropolitan babies vary with the cost of milk would never voice such a statement, however unwittingly it may have been made by those in other lines of activity.

Again, with vegetable oils and lard the present situation often is stated truly enough, but with the reasons therefore given inversely. For many years it has been a truism among economists that the development of vegetable oil shortenings has supplanted lard because of the price differential in favor of the products of the field rather than the herd. Also, the lessened value of the dollar serves in raising the price of substitutes for lard above pre-war rates.

In somewhat similar manner, sliced bacon is often cited as evidence in support of the trend toward factory-packaged foods. Undeniably it is true that, in the larger cities, at least, the excellent habit of using mechanically sliced bacon is gaining ground, but it should be borne in mind that the greater part of such bacon is sliced by the retailer at the time of purchase by the consumer. For performing this rather unpleasant task no specific charge is made by the retailer, whereas factory-packed, sliced bacon almost invariably sells at a substantial increase over popular prices. Obviously, the attention-compelling transparent paper wrapping is confined to the product prepared by the packer in anticipation of sale, rather than by the retailer after the sale has been effected. Here we have an improved product, developed by the manufacturer, that seems likely to alter retailing practice and render possible a merchandising betterment that may well assume significant proportions, but to overemphasize its present importance is extremely easy.

Send Your Bacteriologist To Iowa State in December

FOOD MANUFACTURE in most lines depends upon controlling bacterial action if the beneficial activities of bacteria are sought, or else it depends upon the prevention of bacterial action when the effort is to avoid spoilage by some form of preservation. Food preservation, therefore, is applied bacteriology.

If your concern employs a bacteriologist he should be given the opportunity of attending the annual meeting of the Society of American Bacteriologists and taking

part in the discussions. In 1928 only seven food manufacturing companies had delegates at the meeting—a number so absurdly low that it indicates how little manufacturers appreciate the true nature of their own technical processes.

One of the many problems before this journal is to make manufacturers conscious of the part that this branch of science has in their own affairs. FOOD INDUSTRIES urges them to plan to have their scientific staffs represented at the meeting at Ames, Iowa, on Dec. 30 and 31. The employer will be the gainer in the long run by the friendships and contacts established and the stimulus of contact with world leaders in the science.

Protecting Our Interstate Commerce

ONE of the greatest blessings to commerce, agriculture and industry in the United States, although one seldom considered, is the freedom with which men and goods may pass from one state to another. There are no customs inspections and no tariff barriers such as exist elsewhere, frequently in regions of no greater territorial extent but containing many national frontiers. Indeed, the United States has been called by economists the greatest free-trade area in the world. How much this factor has contributed to the prosperity of this country we probably shall never know. Occasionally, however, we are given an insight into the conditions that might obtain if each state were at liberty to regulate interstate commerce according to its own ideas.

The last session of the Idaho Legislature enacted a law compelling wholesalers of oleomargarin in that state to pay an annual license fee of $200 and retailers $50. Violation of the act is punishable by revocation of charter if an Idaho corporation, or cancellation of permit to do business in the state if an out-of-state corporation. In general, when such a law is enacted it may be assumed that it is either a revenue-raising measure or for the purpose of inspection of the products concerned for the protection of the consuming public.

The constitutionality of the law, attacked by Best Foods, Inc; Falk Mercantile Company, Ltd.; Davidson Grocery Company, Otto Zurcher, and David Van Trump, was sustained early in September by Judges Dietrich, Neterer, and Cavanah, of the U. S. District Court for Idaho, Southern Division.

It was contended that the law violated the federal Constitution by "denying equal protection to the plaintiffs . . . depriving them of their property rights without due process of law" and interfering "with the free movement of interstate commerce." In support of these contentions it was pointed out that no license fee was exacted of those selling butter and hence that the law was discriminatory in favor of butter manufacturers: that by forbidding those without license to sell oleomargarin such sellers were deprived of the right to carry on a certain line of business; and that, as no oleomargarin is manufactured in Idaho but all sold is purchased in other states, the law interfered with interstate commerce.

All these allegations were denied by those representing the State of Idaho, who contended that the state Legislature had full power to tax any occupation even if the tax rate were such as to discourage carrying on that occupation; that oleomargarin and butter were articles of different classification and hence a tax on the former is not discriminatory, and that, as the act requires a license of all those selling oleomargarin in the state regardless of whether it is manufactured in the state or not, it does not interfere with interstate commerce.

The court decision upheld the latter view. Judge Neterer said, in part: "There is no equality between the cow on the farm and her natural product, 'butter' and the manufacturing plant . . . and its artificial product, 'oleomargarin.' Each product has food value, but composed of different elements, and the difference between them is a just basis for classification. . . . The exercise of acknowledged power to tax may not be scrutinized by the court. The responsibility rests upon the Legislature, and if unreasonably exercised, redress rests with the people. . . . The act applies to all dealers in oleomargarin, wherever made. The fact that at present none is made in the state is immaterial. . . . The act is not objectionable because oleomargarin is placed in a class by itself, . . . the state may restrict the manufacture of oleomargarin in a way that does not hamper that of butter."

In our judgment this state of affairs establishes a dangerous precedent in that it encourages the enactment of state tariff laws against the products of other states. Under the decision, New Jersey, for example, which manufactures very little butter but twenty-five million pounds of oleomargarin annually, would be justified in placing a prohibitive tax on butter to encourage the sale of its home-manufactured product. All the arguments of the Idaho case can be used with reverse English.

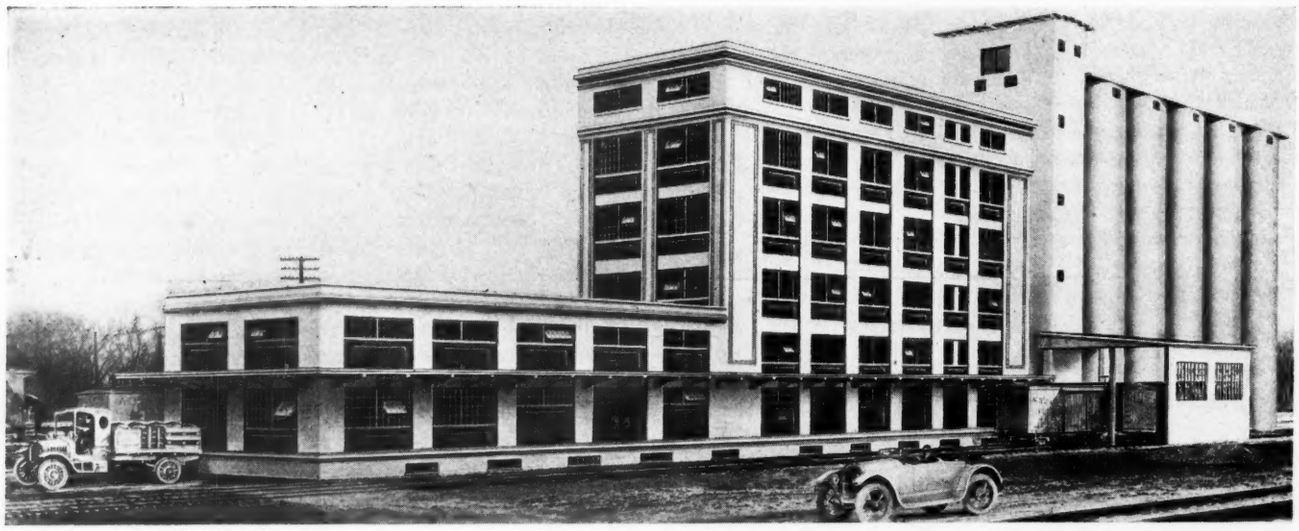
We would be the last to protest against a license law where it is necessary for inspection to insure proper quality. But for a state to enact a license law, without inspection, against a product not manufactured within her borders and one already subject to a vigorous federal law, would seem to us to be a dangerous encroachment on the freedom of movement of our commerce which has so long been one of our greatest blessings.

Food Marketing

A SIGNIFICANT portion of this issue takes the form of *Food Merchandising,* a section of FOOD INDUTRIES, bound separately and placed immediately following our front cover. Here are assembled eight pages of material designed to help the sales manager in his task of effective distribution—a task that we regard as of the same order of importance as production, although differing in nature and personnel.

It is expected that this initial issue of *Food Marketing* will be referred to those in charge of distribution, with the hope that they will let us know what they think of our latest venture. Should our suggested method of handling the important topic of marketing meet with the same hearty approval accorded the initial issue of FOOD INDUSTRIES last fall, the section will, in all probability, be continued.

It is, of course, obvious that the present offering is but a sample of what is to follow. The field of food distribution is far-reaching and of complex characteristics. It is at present undergoing a more or less rigorous re-organization, with consequent need of journalistic interpretation and clarification. It will be the purpose of the *Food Merchandising* section to attack all problems from the point of view of generalized, scientific distribution, in so far as that method of treatment is practicable.



Modern flour mill of Robinson Milling Company showing cylindrical tanks for wheat storage

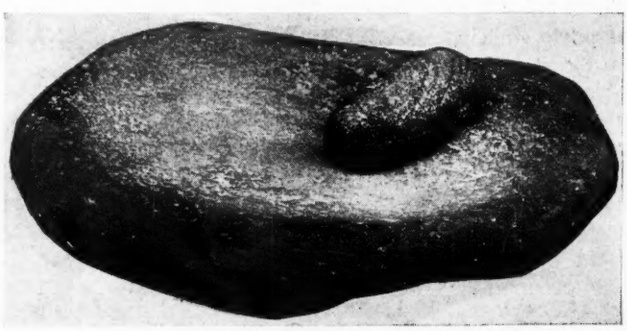
The Oldest Food Industry In Modern Dress

By C. O. SWANSON
Head of the Department of Milling Industry
Kansas State Agricultural College

WHEAT is one of the world's three great cereals, the others being corn (maize) and rice. Of corn the world produces more than four billion bushels, three-fourths of which is grown in the United States. Most of the corn in our country is used indirectly for the production of human food. Rice is used directly as food, being the cereal crop of hot, moist climates. The world's production is equivalent to about three billion bushels. This is also the approximate size of the world's wheat crop. Wheat is the great food cereal in the less hot and moist countries of the world. The best climates for wheat production are those having a rainfall of 20 to 30 inches, depending on several other climatic factors. Wheat also is raised where the rainfall is as much as 50 inches and as little as 10 to 15 inches. The world's notable wheat areas are the great plains of the United States, western Canada, southeastern Europe, and southwestern Asia.

The first problem in flour manufacture is the proper selection of wheat. Although white flour finds a great variety of uses in cooking, most of it is employed in making light bread, with yeast as the leavening agent. For baking such bread, flour from hard wheat is best. The greater portion of the world's hard wheat is produced in the areas mentioned, which are districts where the weather is hot and fairly dry at the time when the wheat matures and ripens. Soft wheat is grown where the rainfall is greater and the weather more moist and cooler during the maturing period, being the prevailing type in eastern United States and western Europe. Flour from soft wheat is best for making hot breads, using sodium bicarbonate as the leavening agent, although by employing suitable methods it can

A stone mill of the oldest type, used by North American Indians for crushing corn. From such crude methods the process of flour manufacture has advanced to the present elaborate and efficient system.

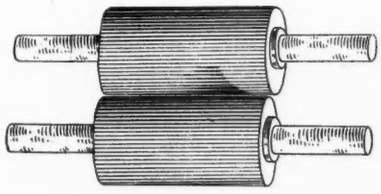


be used also with yeast. Soft-wheat flour is preferred in all kinds of pastry work.

In addition to these two main groups of wheat there are a number of smaller groups, such, for example, as durum, best suited for making macaroni, and some white wheats that are excellent for manufacturing certain breakfast foods. It should not be inferred that there is a hard and fast rule as to the uses of these wheats, but rather that certain types of wheat are best adapted for certain specific purposes.

Whether a mill shall grind hard or soft wheat depends upon its location with reference to the wheat territory from which it draws its supply, and also its market. Minneapolis, Buffalo, and Kansas City are the three great milling centers of the United States, and in the order named. Minneapolis developed as a milling center because of water power, and the beginnings of the extensive growing of hard-spring wheat at a time when there were great improvements in the methods of flour manufacture. Buffalo has developed because of the advantages of the Great Lakes transportation which brings in the wheat from western Canada as well as the principal spring-wheat states of the North, and Kansas City has direct access to the great hard winter-wheat territory of the Southwest. A number of milling cities are found in this area, the combined flour output of the district being the greatest in the United States. Mills grinding soft wheat are relatively widely scattered, as are also the producing areas.

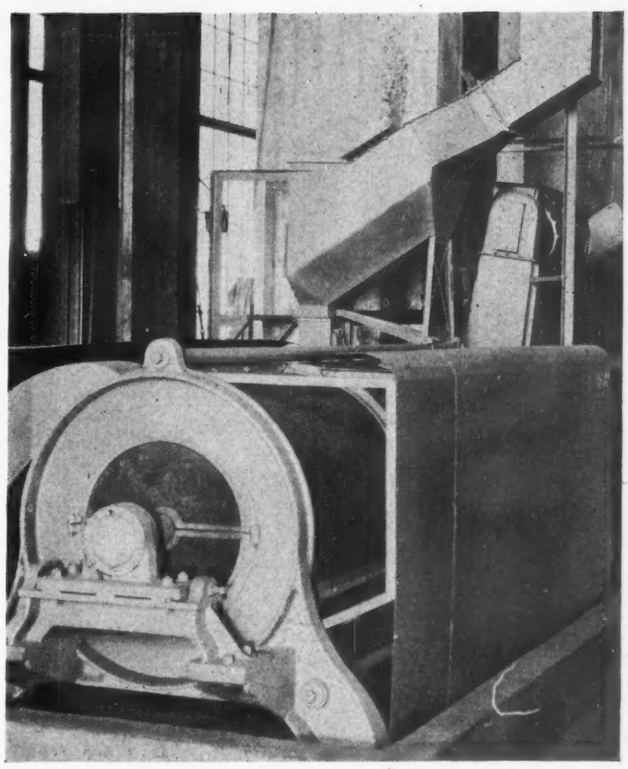
Whether a mill shall grind hard, soft, durum, or white wheat is usually determined when the mill is built. There is, however, a constant wheat selection within the area from which the mill gets its supply. One of the greatest demands made on present-day flour is that it shall be uniform—not only from day to day but from month to month and from year to year.



Corrugated rolls, the essential characteristic of modern milling. The smooth rolls have the same general shape but with smoother surfaces.

Modern, large-scale bread production necessitates such uniformity. A baker recently said to me, "I once bought a car of very high-grade spring-wheat flour, and paid a good price for it. It was so different from the flour which we had been using that the results were not satisfactory. We had to change our methods, but by the time we knew how to use this flour, it was gone. What we need is not only a flour suitable for our purpose but it must also be of the same quality all the time." To make such uniform flour one must have uniform wheat, and this calls for the assembling of a uniform mill mixture.

This problem would be comparatively easy if the wheat in any given area was uniform, but such is far from the case. Although wheat is sufficiently uniform to be classed as hard winter wheat in the Southwest, hard spring in the Northwest, or soft wheat, as the case may be, the variations occurring in these classes are such as to require careful wheat selection and subsequent blending if a uniform flour is to be obtained. Wheat varies not only from county to county but from farm



Wheat enters this Wolf washer at the left, where it is thoroughly swished in water by beaters. Surplus water is removed by centrifugal force, only a little over 1 per cent of water being added to the wheat by the washing process.

to farm, and in the fields of the same farm. Protein is one of the recent, and at present most extensively used, measures for wheat quality. Four samples of wheat obtained from a farm near Manhattan, Kan., tested, respectively, 10.8, 12.6, 15.3, and 15.5 per cent protein. Wheat varies also in weight per measured bushel (test weight) hardness, and certain inherent characteristics which can be determined only by milling and baking tests. For this reason the chemical laboratory is a necessity in the modern flour mill.

The first step each year in the selection of wheat for milling is a study of growing conditions, prevailing temperatures and the amount of rainfall during the maturing period having an influence on quality. As soon as the new crop is gathered, harvested, and threshed, the mills start to study its quality. Samples are obtained from the different buying stations. These are then milled, analyzed, and the flour baked. In this way the miller learns that the quality of the wheat from one area is well adapted to balance the quality of the wheat from another area. The term strength is used to designate that characteristic in flour pre-eminently desired for making light bread with yeast as the leavening agent. This characteristic usually is associated with high protein content. In some years the protein content is prevailingly lower than in other years. At such times high-protein wheats are sold at a premium.

Protein tests usually are made on every carload, and the wheat is binned on this basis. From these bins a preliminary blend is made and tested by milling the wheat and baking the flour. Wheat that is stronger, weaker, or having other necessary characteristics, may then be added to modify the blend, which is again tested. Not before the laboratory has approved the blend does

the wheat go to the mill. By such methods mills are able to manufacture uniform flour. Large mills have an advantage over smaller mills in that they buy their wheat over a wider territory and have greater binning facilities. This is one of several reasons why the number of mills in the country is decreasing. In 1927 there were 4,035 establishments producing wheat flour. However, one-fourth of these manufactured about 90 per cent of all the flour. In 1919 there were 10,708 establishments. The smaller and medium-sized mills have been crowded out, but as much or more flour is manufactured now as was the case a few years ago.[1]

After a satisfactory blend has been made there follows the cleaning process. Wheat must be clean enough to eat before the milling process proper begins, a necessary prerequisite to the manufacture of the fine white flour demanded by present standards.

Wheat cleaning is an elaborate process; in fact, it may be said to be an art or a science in itself, fully as important as that of milling. The principal impurities in wheat are seeds of other grains, chaff, dust, weed seeds, and a nondescript variety of material accumulated while the wheat was in transit from the farmers' bins to the mill elevator.

Loose material is removed by a large machine which operates on the principle of a fanning mill. Part of the impurities are removed by gravity when the wheat passes over sieves and part by suction with strong air currents. In this way all the material larger or smaller than the wheat kernel is removed, as well as the light chaffy material.

Some wheat contains material that can be removed only by washing in water. This is particularly true when stinking smut or bunt is present, or when wheat is very dirty. Such machines must not only wash the wheat but, after washing, the surplus water must be removed, which is done by centrifugal force, accompanied by throwing the wheat around by means of beaters or paddles inside a drum made of perforated metal.

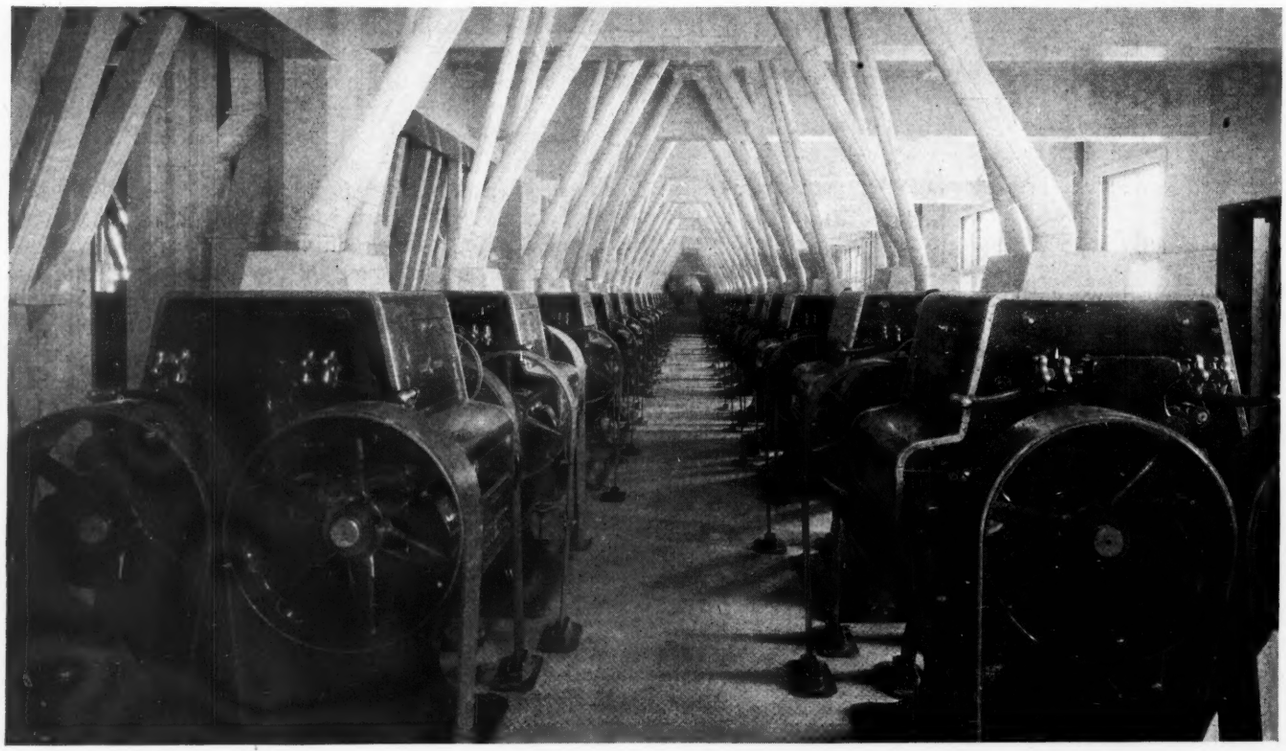
It is also necessary to remove all materials of metallic nature, such as nails, screws, or other particles of iron which have found their way into the wheat from farm machinery, wagons, freight cars, or in other ways. These are removed by passing the wheat over strong magnets.

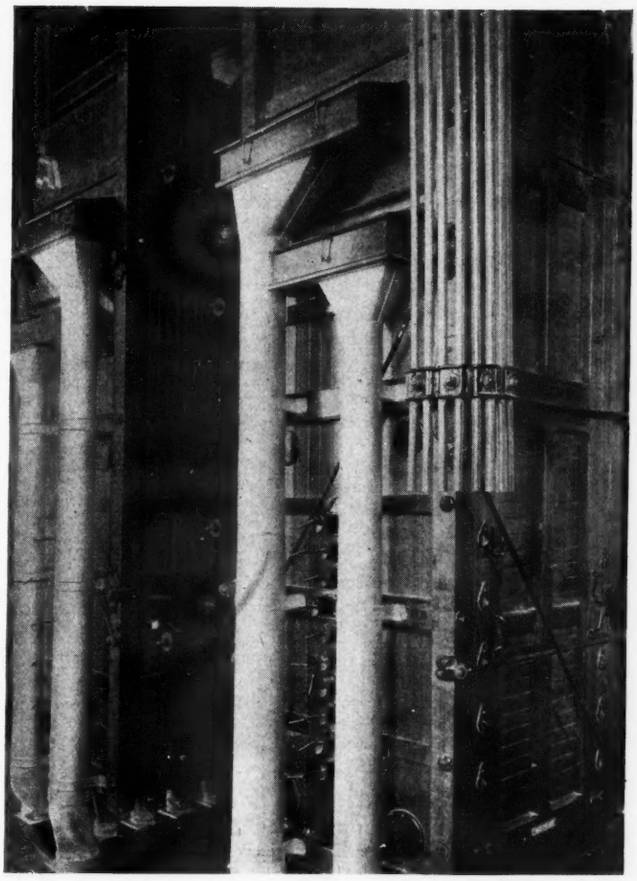
Not yet clean enough for milling, the wheat must next be scoured. On the end of every wheat kernel are found some very small, fine hairs. If these were not removed the milling processes would break them into such small pieces that they would get into the flour, with a resultant darkening of its color. Dark colored flours fail to satisfy modern demands because people instinctively associate a dark color in flour with dirt. Every wheat kernel has a crease, running lengthwise and half as deep as its short diameter or thickness. This serves as a place for lodgment of dirt or impurities which are not easily removed.

A wheat scourer is essentially a long drum or cylinder made of perforated metal, containing paddles which revolve very rapidly. When wheat passes through this machine it is severely beaten by the paddles, rubbed against the perforated metal forming the walls of the cylinder, and acted upon by the attrition of kernel against kernel. This process breaks off the fine wheat hairs, knocks out any dirt that may be lodged in the

1 This statement, accurate as it stands, should not be permitted to obscure the fact that wheat flour consumption by our people has been declining for the past 40 years. The per capita drop from 1904 to 1921 was 22 per cent. Since then this figure has risen slightly, as Dr. Swanson states, but not enough to restore flour to its former pre-eminent status in our diet.—Editor.

Roll floor of Russell Miller plant at Buffalo, showing grinding machines arranged in rows. Stocks reach the machines through the circular spouts. After milling, the ground stocks are taken by elevators or conveyors to the top floor. Dust is conveyed to dust collectors.





Modern power-driven sifter, as made by Great Western Manufacturing Company. The sieves are inside and arranged in stacks, the coarsest on top and then finer and finer below, the flour sieves being the lowest.

crease, and loosens any material not previously removed, all undesirable material being drawn off by air suction.

The final step in the preparation of wheat for milling is the tempering process. When millers first began to grind hard spring wheat or hard winter wheat they found that the flour was of a darker color than they produced from the softer wheats to which they were accustomed. Because of its darker color flour from hard wheat was at first sold at a discount in comparison with soft-wheat flour. The darkening in color was caused by the fact that the bran of hard wheat is so brittle that particles thereof small enough to pass the flour sieves were produced by the different processes of grinding, a difficulty that was overcome when millers learned the process of wheat tempering.

To better understand the need for wheat tempering it is helpful to recall something of the structure of the wheat kernel. This consists of three main parts: the bran coat, the germ, and the endosperm or that inside portion from which flour is made. Scientific milling is based on the fact that these three parts differ in relative toughness or friability, the bran coat and the germ being less easily pulverized than the endosperm. When water is added to the wheat the bran coat is made even tougher than it was when dry, and this probably is why the process became known as "tempering." It consists simply in adding water to the wheat—the quantity thereof depending upon its dryness and hardness—mixing the two intimately, and then allowing the wheat to stand in a bin until the water has thoroughly penetrated the wheat kernel. By this treatment the bran coat is rendered sufficiently lacking in friability to prevent the production of specks of bran fine enough to pass through the bolting cloth.

The purpose of milling is to remove the bran coat and the germ from the endosperm and grind the latter into fine, white flour. Of the kernel, the bran coat constitutes about 14.5 per cent, the germ about 1.5 per cent, and the endosperm about 84 per cent. Theoretically it should be possible to obtain approximately 84 per cent of the cleaned wheat as flour, but at the present time only 70 to 75 per cent is so utilized, the rest being sold as feed. This means that there still is further progress to be made in milling.

In addition to demanding a white flour, of the sort possible only by practically complete separation of the bran from the endosperm, modern marketing conditions call for a flour that may be shipped long distances and stored for considerable periods. To accomplish this, removal of the germ is necessary; otherwise its oily constituents will rancidify and render the flour unsalable.

Modern milling is an elaborate process compared with the methods of ancient times, in which stones were used for either pounding or rubbing. Later, one stone was rotated on top of another, the wheat being fed into an opening in the center of the upper stone. These were the mills of Bible times referred to in such expressions as: "Two women shall be grinding at the mill."

A great improvement in milling came with the use of larger stones turned by a lever and by means of which it was possible to use animals as a source of power. The first use of water power was in connection with milling, and this source of power continued until the invention of the steam engine in the latter part of the eighteenth century.

Stones were used as grinders in the United States until after the Civil War, when they were replaced by steel rolls. At the present time practically all flour is manufactured by the so-called "roller" process. In shape these rolls are somewhat like huge rolling pins, smaller sizes being about 6 inches in diameter and 12 inches long, and larger sizes from 9 to 10 inches in diameter and 30 or more inches long. Bearings are so arranged that two rolls are parallel to each other. The rolls turn toward each other, one at a faster rate than the other. As whole wheat, or partially ground stock, is passed between the rolls the crushing is accomplished by pressure in combination with a shearing action.

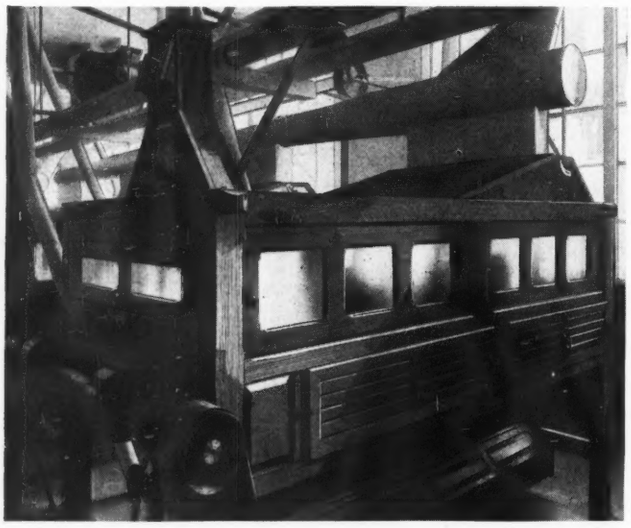
There are two classes of rolls, corrugated and smooth. Corrugated rolls are so named because on their surface are corrugations or grooves which run lengthwise of the rolls. In general shape these corrugations are like those on an old-fashioned washboard, but are very much smaller in size—something like dull teeth in a fine saw. The surface of the smooth rolls has a smoothness somewhat like print paper.

Seven main steps constitute the milling process proper: breaking, sifting, purifying, reducing, bolting, flour blending, and bleaching. Additional steps include packing and loading in cars.

Breaking is accomplished by the corrugated rolls known as the break rolls, of which there are usually five sets in the average mill. Thoroughly cleaned wheat is fed in an even stream into the first set of break

rolls, which are set sufficiently far apart to crush the wheat kernel into relatively coarse fragments. By means of conveyors this ground material is taken to the top floor of the mill where it is sifted and separated into a number of products, all differing in size and relative proportion of branny material.

The sifted products go to various parts of the mill for subsequent treatment, the coarsest being conducted into the second set of break rolls. Here they are



Middlings purifier of the Wolf type. This appliance, together with the introduction of steel rolls, ushered in modern milling. The purification is accomplished by means of air currents, which lift out the light, fluffy bran flakes. It was in connection with the use of this machine that the term patent flour originated.

ground a little finer and the ground product is again sent to the top of the mill, where the sifting and distribution are repeated. The coarsest material from the second sifting is sent to the third break, when the grinding is a little finer than on the second break. This is the main idea in the breaking process—to partially grind the wheat or products, then sift and re-grind. The purpose of doing this is to avoid crushing the bran into fragments so fine that they will pass the flour bolting cloth. When the material has been ground by the fifth break or when no more flour can be scraped from the bran coat, a product is obtained after sifting known as the flaky, clean bran. This is the source of the bran used for human food. Commercial bran used for feed contains also the better products obtained in cleaning wheat.

Sifting is done partly on wire sieves and partly on silk bolting cloth. All sifting devices are placed one above the other with the coarsest on top. Those below are gradually finer and finer, the lowest being of such fineness that it allows only the flour to pass through.

Middlings is the name given to the product produced in grinding; that is intermediate between the wheat (or the coarse material ground on the breaks) and the flour. Those produced by grinding on the break rolls are of all degrees of fineness and quality, and consist mainly of endosperm which has not yet been ground to flour. Some middlings are the size of coarse corn meal, others are nearly as fine as flour. Wheat breakfast foods consist mainly of the coarse middlings.

Some middlings are for the most part fine endosperm, others are part bran coat and part endosperm. Mixed with the middlings are fragments of bran, very light and fluffy, which cannot be removed by sifting. These can be removed only by a current of air and the so-called middlings purifier is a device for removing these fluffy bran particles. Its main parts are a housing inside of which is a frame on which is stretched bolting cloth varying from coarse to fine, and a fan for producing the air current. The frame on which is stretched the bolting cloth is made to vibrate very rapidly back and forth. Middlings are fed in at one end of the purifier, the vibration of its frame causing them to pass over the bolting cloth to the other end. This enables the air current to remove the fine fluffy material, and because the bolting cloths are of different mesh the middlings also are graded into various sizes.

The middlings purifier was introduced about the time that steel rolls were first employed and it enabled millers to produce a notably superior flour. Because it was a patented device, flour made in mills which had a middlings purifier became known as "patent flour." Thus patent flour, if true to name, should be made from purified middlings.

After the middlings have been purified they are reduced to flour by the smooth rolls, of which there are in most mills at least eight sets. As in the breaking process, the reduction of middlings takes place gradually; that is, they are partially reduced by one set of rolls, then the product is sent to the sifters, where it is separated into various sizes, and these are then sent to other rolls to be further reduced. This process is repeated until the middlings are either reduced to flour or are in the form known as "shorts." If the middlings were reduced to flour by one operation the bran snips which adhere to the middlings would also be reduced to such fineness that they would pass the flour sieves and this would give a dark colored flour. It is the gradual reduction of the middlings by the smooth rolls which produces the granular, white flour.

The germ is loosened in the breaking process. It is of such size that it gets into the coarser middlings. As the germ is tougher than the endosperm, it is flattened when the middlings are acted on by the smooth rolls. In this flattened condition it will not pass through the same mesh bolting cloth as the reduced middlings, and hence can be sifted out.

Sifting cloths are made of silk, the coarser having 30, 40, 50, or 70 meshes per linear inch. These are used in sifting out branny material from the middlings and also for grading middlings into different sizes. Cloths on which flour is bolted have from 109 to 125 meshes per linear inch. The cloth through which flour is sifted has about 12,000 openings per square inch. As the diameter of the thread in the bolting cloth is nearly the same size as the openings it would take more than 40,000 flour particles to cover 1 square inch of surface. This gives some idea of the fineness of flour.

In the breaking and reduction processes, the product of each grinding is sifted and in this sifting some flour is obtained. Thus, flour will be produced from each of the break grindings and from each of the reduction grindings. This means that there are 12 or more streams of flour produced in the milling process. The larger the mill, the more streams; each stream of a somewhat different quality. The best flour streams are produced from the best purified middlings. Flour streams obtained in the breaking process and in the

last reductions of the middlings are of somewhat poorer quality. Thus it is possible to make several grades of flour from the same wheat.

Flour grades as determined by the milling processes are known technically as straight, patent, clear, and low-grade. If all streams made in the mill were blended this would be 100 per cent flour, and could be called "straight." Usually some of the very poorest streams are not included in the so-called straight. If 2 or 3 per cent is removed the flour is 97 or 98 per cent straight. "Short patent" is made by blending 65 to 70 per cent of the best flour streams. If these are increased to 85 or 90 per cent of all the flour, there is obtained "long patent." When a patent and a low grade are made the flour between the two is technically known as "clear." This method of designating flour grades is rather confusing. It would be much better to refer to the grade on the basis of the percentage of flour obtained from the wheat.

The last process in manufacturing flour, aside from packing and shipping, is bleaching. The endosperm of the wheat kernel contains a yellow coloring matter called carotin, which cannot be removed by any milling process. Popular opinion favors a white flour because whiteness is associated with purity. This liking for whiteness in flour probably dates back to ancient times when preparation of wheat for milling was less efficient than now and because of such a condition a dark color in flour was associated with dirt.

There are at the present time four principal reagents used in removing this yellow coloring matter: chlorine, nitrogen tri-chloride, nitrogen peroxide, and benzoyl peroxide. The last one is in the form of a solid, and the other three are in the form of a gas. These reagents are mixed and agitated with flour in a closed drum. This brings the flour into intimate contact with the reagents, which destroy the yellow color. So far as is known, there is no injurious residue left in the flour from any of these reagents, nor has it been shown that these reagents are in any way deleterious to health.

One of the most outstanding characteristics in a modern mill is the few people required to do the work. The average number of wage earners in the 4,035 establishments was 29,982 for the year 1927. In a flour mill first consideration must be given to the space occupied by the machines.

On entering a flour mill one's first impression is the small number of workers and the size and extent of the machines. The following figures from a large mill in the Southwest shows the number of men employed in relation to output:

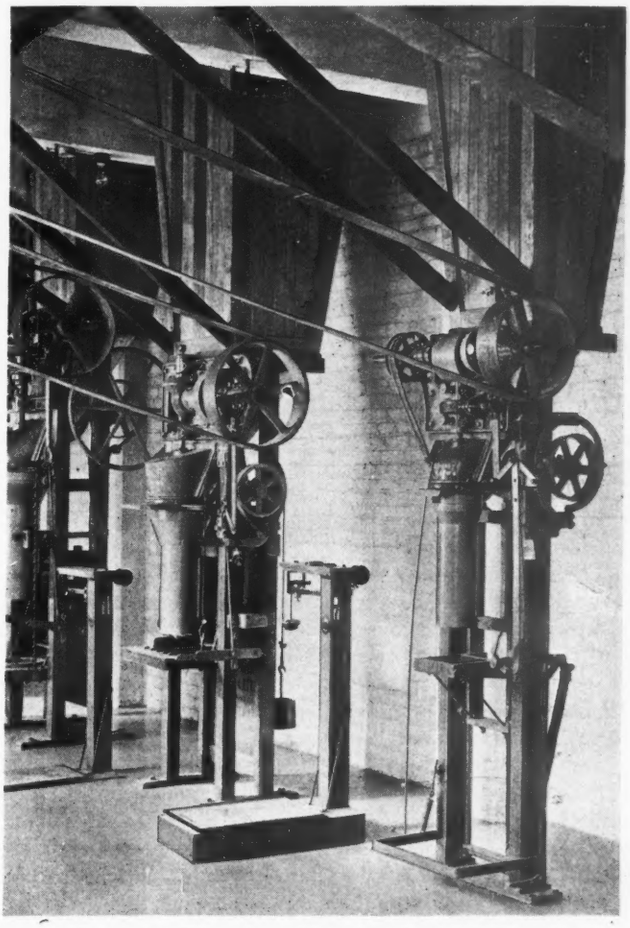
Work	Number of Men
Handling of wheat from car to elevator	5
Actual work of grinding	21
Packing flour and feed and loading	37
Accessory men	21
Total	84

When in full operation this mill produces 3,500 barrels every 24 hours, and each of the 84 men works 8 hours. This means that for each 8 hours of man labor there is produced 41 barrels of flour. Thus, for each barrel there is required a little less than 12 minutes of one man's labor. If these figures are analyzed further it is seen that only one-fourth of the men are actually employed in the work of grinding, or but 3 minutes of time for grinding each barrel. One barrel is about the amount of flour consumed by the average adult in one year. In ancient times it took the housewife longer to crush the grain needed for one day than is now required in man labor to mill all the flour needed by a family in a whole year.

The U. S. Tariff Commission a few years ago investigated the costs of producing flour, obtaining the following items:

Costs in Cents per Barrel

Labor	13.6
Factory expense	24.4
General administration	18.4
Sacks	36.5
Advertising	5.6
Selling expense	32.5
Total	$1.31



This Wolf flour packer facilitates getting the requisite quantity of such a light, fluffy material as flour into a sack. This is accomplished by a large "screw" which fits inside the cylinder. The cloth sack is placed outside this cylinder and on top of the small platform. As the sack fills, this is lowered, and when the sack is full, the packing device is automatically stopped.

The first three items represent the actual cost of converting the wheat into flour. By this it is seen that the average adult pays less for having his annual wheat quota converted into flour than he pays for half an hour's service of a plumber or an automobile mechanic. Flour milling has gone further than any other mechanical art in eliminating human toil and costs in producing one of the great necessities of life.

FOIL-WRAPPED *Food Material*

I—An Investigation Concerning the Use of Zinc Foil in the Food Industries

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OWING to the widespread use of metals in industries where possible contamination of foodstuffs can occur, there is increasingly active scrutiny on the part of hygienists to determine the extent to which this constitutes a factor in public health. The use of metal foils for wrapping food materials is a case in point. The foils commonly used for this purpose—tin foil, tin-lead alloy foil, lead foil, aluminum foil—have encountered a new rival in zinc foil. The grades of zinc which are used for zinc foil and which were examined in our tests fall within the grade 2 classification of the American Society for Testing Materials (0-0.20 per cent lead, 0-0.3 per cent iron, 0-0.50 per cent cadmium—lead + iron + cadmium maximum 0.50 per cent). Other impurities if present are only in spectroscopic quantities. The quantities of lead and cadmium which under most extreme conditions could contaminate food wrapped in zinc foil are negligible.

Zinc foil has many properties which make it desirable compared with other foils, and it therefore promises to be a factor of some consequence in the wrapping of foodstuffs. For this reason it has been thought necessary to determine the extent to which it is likely to contaminate food so wrapped, and the factors which enter into this contamination.

Zinc foil finds increasing use in the soft-drink and confectionery industries. The foil is used for wrapping chocolate candy and for wrapping the necks of ginger ale bottles. While the possibility of contamination is slight—particularly in the latter case—it was thought worth while to submit them to conceivable, although remotely possible, conditions that might occur in the handling of such foodstuffs.

With but few exceptions the material to be analyzed for zinc was ashed and the analysis made on the ash. Both turbidimetric and volumetric methods[1] were used for the zinc estimation, and the usual precautions taken to avoid impurities in reagents or the derivation of zinc from laboratory ware[2]. The food materials were examined in all cases for their natural zinc content before they were allowed to come into contact with zinc foil, and the proper correction was applied to the analyses.

The factors which were considered of importance with relation to possible contamination of foods wrapped or having possibility of contact with zinc foil were acidity, moisture content, time of contact and temperature. The degree of acidity obviously would be an important factor, as a very acid or alkaline food probably would corrode the zinc wrapper to a considerable extent. Moisture is of importance because a dry food of high acid content might cause less corrosion than a less acid but more moist food where there would be the continuous transfer of small quantities of acid.

The natural zinc content of seven different brands of ginger ale and of the confectionery investigated is given in Table I. It is a fair assumption, based upon previous experiences, that this zinc was present in the food material itself and not added by contamination during manufacture, although the latter is a possibility.

Time of Exposure—Squares of zinc foil of uniform size (3 in. square) were placed in the ginger ale and the bottles immediately recapped. The ginger ale was allowed to stand in contact with the zinc foil for periods varying from an hour to two months. For analysis, the ginger ale—which otherwise was quite clear—was filtered to remove occasional small particles of zinc foil. The gas collecting on the surface of the zinc foil generally buoyed it up so that in most cases it was necessary to weight the foil with a glass rod. Owing to a small amount of oxygen present, corrosion was much more rapid at the surface of the liquid than when the foil was completely immersed. The results obtained are shown in Table II. The same brand of ginger ale (F) was

Table I—Natural Zinc Content in Ginger Ale And Confections

GINGER ALE

Brand	Type	Zinc Content: Per Bottle, Mg.	Per 100 cc., Mg.	Per Pint, Mg.	Parts per Million
A	Pale Dry	0.18	0.05	0.22	0.5
B	Aromatic	0.45	0.16	0.75	1.6
C	Extra Dry	0.55	0.15	0.69	1.5
D	Golden	0.55	0.11	0.52	1.1
E	Golden	0.68	0.14	0.66	1.4
F	Pale Dry	0.87	0.23	1.11	2.3
G	Aromatic	0.93	0.22	1.04	2.2

CONFECTIONS

Name	Per 100 Gm.	Parts per Million
Chocolate mints B	1.57	15.7
Chocolate mints B	1.64	16.4
Chocolate mints A	1.68	16.8
Chocolate mints A	1.67	16.7
Chocolate mints A, Fondant	0.58	5.8
Chocolate mints A, Chocolate	3.24	32.4
Chocolate C	1.52	15.2
Chocolate D	2.18	21.8
Acid drops (made in laboratory)	0.36	3.6

used throughout these experiments, and analyses made of several samples in order to obtain accurate information with respect to its natural zinc content.

It is apparent from these results that the quantity of zinc dissolved is roughly proportional to the time of exposure and that oxygen is a very important factor in the solution of the zinc. For instance, after two months of exposure when wholly immersed, the quantity of zinc dissolved per 100 cc. of ginger ale was only 66.3 mg., whereas after but two weeks of exposure in a dish open to the air the amount dissolved was 87.5 mg. per 100 cc.

In the case of candy the time effect of direct contact of zinc with the confection is enormously less than with ginger ale. This is shown in Table III, in which candy wrapped in zinc foil at room temperature was analyzed for zinc after varying periods of storage. Even with the fondant in direct contact with the zinc foil, or with acid drops directly wrapped in zinc foil, the quantity of zinc is small. After standing in contact with the candy the zinc foil was always bright and clean with no evidence of pitting or corrosion.

Effect of Temperature—In general the quantity of zinc accumulated is roughly proportional to the temperature, more zinc being dissolved or retained at a higher temperature than at a lower. This is clearly shown in Table IV.

Effect of Acidity—In the accumulation of zinc by foodstuffs in contact with zinc foil the acidity would be considered a very important factor. The total titratable acidity of ginger ale (determined after removal of dissolved CO_2) together with that of various confections compared with the quantity of zinc dissolved in contact with zinc foil for two weeks is given in Table V. The acidity of the confection was determined in terms of cubic centimeters of N/10 KOH required to neutralize 100 grams. Hydrogen iron determinations were made only approximately, but showed a somewhat more direct relationship to the degree of attack on the zinc foil than the titration values alone. In the case of chocolate mints the pH value of the fondant was found to be 4.4; that of the chocolate 4.7—the latter much obscured by the reddish brown color of the solution. The pH determinations of the ginger ale were made with CO_2—free material. The quantities of zinc dissolved at the various degrees of hydrogen ion concentration are given in Table VI. There is evidence of proportionality between the

Table II — Solvent Action of Ginger Ale on Zinc Foil

Conditions	Time Days	Time Hours	Zinc Content Per Bottle, Mg.	Per 100 cc., Mg.	Per Pint, Mg.	Parts per Million
Foil floating in capped bottles*	7	..	131.47	45.21	213.89	452.1
Foil immersed in capped bottles*	2	..	18.35	4.83	22.85	48.3
	4	..	44.31	11.40	55.17	114.0
	6	..	69.29	18.24	86.28	182.4
	7	..	76.30	20.14	95.26	201.4
	8	..	78.91	20.77	98.25	207.7
	8	..	76.02†	20.01†	94.68†	200.1
	10	..	84.67	22.28	105.40	222.8
	12	..	89.48	23.55	111.40	235.5
	12	..	92.37†	24.31†	115.00†	243.1
	14	..	95.25	25.07	118.60	250.7
	18	..	112.55	29.61	140.13	296.1
	20	..	126.97	33.41	158.10	334.1
	24	..	146.20	38.53	182.26	385.3
	60	..	251.93	66.29	313.58	662.9
Foil floating in open dishes; room temperature, 20° C.	..	1	2.74	0.72	3.41	7.2
	..	2	2.28	0.60	2.84	6.0
	..	3	3.80	1.00	4.73	10.0
	..	4	4.26	1.12	5.30	11.2
	..	5	4.56	1.20	5.68	12.0
	..	6	5.32	1.40	6.62	14.0
	..	7	6.08	1.60	7.57	16.0
	7	..	280.77	73.90	349.60	739.0
	14	..	340.36	87.53	414.20	875.3

*Ginger ale bottles opened and immediately recapped after insertion of foil.
†Embossed foil with satin finish.

Table III — Zinc Retained by Candy on Storage in Zinc Foil

Name	Temperature, °C.	Time Wrapped, Weeks	Zinc Retained Per 100 Gm., Mg.	Parts Per Million
Chocolate mints A	20	2	0.50	5.0
Chocolate mints A	20	5	6.51	65.1
Chocolate mints A, Fondant	20	2	3.00	30.0
Chocolate mints A, Fondant	20	5	4.84	48.4
Acid drops	20	2	0.46	4.6

Table IV — Effect of Temperature

GINGER ALE

Conditions 3-in. Squares of Zinc Foil in Ginger Ale One Week	Temp. °C	Zinc Dissolved Per Bottle, Mg.	Per 100 cc., Mg.	Per Pint, Mg.	Parts Per Million
Bottle open; foil floating	22.0	233.6	61.3	291.0	613
Bottle open; foil immersed	22.0	179.8	49.8	235.9	498
Bottle open; foil floating	4.5	123.1	32.6	154.4	326
Bottle recapped; foil floating	22.0	131.5	45.2	213.9	452
Bottle recapped; foil immersed	22.0	76.5	20.1	95.3	201
Bottle recapped; foil floating	4.5	38.7	10.2	48.2	102

CHOCOLATE MINTS

Conditions	Temp.	Per 100 gm.	Parts Per Million
Wrapped 2 weeks	20.0	0.50	5.0
Wrapped 2 weeks	29.4	0.54	5.4
Wrapped 2 weeks	36.67	33.65	336.5
Wrapped 5 weeks	20.0	6.51	65.1
Wrapped 5 weeks	29.4	8.21	82.1
Fondant exposed 2 weeks	8.0	2.90	29.0
Fondant exposed 2 weeks	20.0	3.00	30.0
Fondant exposed 2 weeks	29.4	3.03	30.3
Fondant exposed 5 weeks	8.0	3.17	31.7
Fondant exposed 5 weeks	20.0	4.84	48.4
Fondant exposed 5 weeks	29.4	15.73	157.3
Acid drops exposed 2 weeks	20.0	0.46	4.6

Table V — Effect of Acidity

GINGER ALE

Brand	Normality	Zinc Dissolved Per Bottle, Mg.	Per 100 cc., Mg.	Per Pint, Mg.	Parts Per Million
E	0.018	60.8	12.6	59.4	126
F	0.021	95.3	25.1	118.6	251
D	0.015	165.7	34.2	161.7	342
G	0.028	154.3	37.2	175.9	372
B	0.021	131.7	46.2	218.7	462
C	0.027	185.0	48.7	230.3	487
A	0.022	196.9	51.8	245.1	518

CONFECTIONS

Type	Temperature Deg. C.	N-10 KOH Per 100 mg. cc.	Zinc Accumulated in Two Weeks Per 100 gm. mg.	Parts Per Million
Chocolate mints A, Fondant	20	11.6	2.90	29.0
Chocolate mints A, Chocolate	20	127.9	3.24	32.4
Chocolate C	20	29.5	0.58	5.8
Chocolate D	20	62.3	1.10	11.0

Table VI — Effect of pH on Solubility of Zinc In Ginger Ale

Number	Brand	pH	Zinc Dissolved Per 100 cc. Mg.	Parts Per Million
1	E	2.7	12.5	125
2	F	2.6	25.1	251
3	D	2.5	34.1	341
4	A	2.5	51.8	518
5	G	2.4	37.2	372
6	B	2.4	46.2	462
7	C	2.3	48.7	487

Table VII — Short Period of Contact

Liquid	Temp. Deg. C.	Zinc Dissolved Per Bottle Mg.	Per 100 cc. Mg.	Per Pint Mg.	Parts Per Million
Ginger ale	20	2.28	0.60	2.84	6.0
Ginger ale	20	2.43	0.62	3.03	6.2
Distilled water saturated with CO_2	20	0.76	0.20	0.95	2.0
Distilled water saturated with CO_2	0	0.53	0.14	0.66	1.4

pH and the amount of zinc taken up. The greater the hydrogen ion concentration the more zinc dissolves.

Since ginger ale bottles are wrapped only on the outside with foil and the chance of contamination therefore is slight, an experiment was devised to find the degree of solution of zinc that could occur by pouring the entire contents of the bottle over the zinc foil very slowly. The experiment was repeated, using distilled water saturated with CO_2 both at room temperature and at 0 deg. C. in place of ginger ale. These results are summarized in Table VII.

In this experiment the liquid was poured over the zinc foil very slowly—at a rate not faster than 300 cc. in ten minutes, so that it represents an extreme condition with a favorable opportunity for corrosion. The average quantity of zinc taken up (2.36 mg. per bottle) is negligible.

Emetic Effect—In an investigation of the emetic effect of zinc sulphate, Schwartze and Alsberg[2] found that emesis in cats could be produced by this salt when the zinc content reached 1,500 parts per million. They reached the important conclusion that the effective emetic dose can be expressed with exactness only in terms of concentration. Dilution or the presence of food diminishes the nauseating effect of zinc salts.

It should be pointed out that the inorganic salts of zinc produce emesis more readily than the organic salts, and of the inorganic group the chloride and sulphate are particularly active. The zinc accumulated in foodstuffs from contact with zinc foil is in the form of organic salts and a greater degree of tolerance in connection therewith may be expected.

Experiments were made in which the zinc foil used in these experiments was dissolved in various acids—e.g., sulphuric and acetic—and the neutral solution given to dogs in lieu of their drinking water. At a concentration of 1,388 parts per million, or a total intake of 320 mg. of zinc or sulphate, vomiting occurred; while at lower concentrations—750 parts per million, or 187 mg. of zinc as acetate—no vomiting could be induced. Zinc acetate was administered both in meat broth and in water at a concentration of 750 parts per million without producing vomiting.

IT IS of interest in this connection that Sale and Badger[3] found that root beer which had been made in galvanized-iron buckets and had caused nausea and vomiting contained only 229 parts per million of zinc. This is a lower figure by far than any obtained in our experience and is much lower than that shown to be necessary in the researches of Schwartze and Alsberg[2]. The total intake of 187 mg. of zinc as acetate with no noticeable effects is far in excess of the quantities which occurred in this investigation as accumulated zinc, except in the cases of grossest contamination, which occurred under unlikely conditions—e.g., the entire strip of foil when completely dissolved in a bottle of ginger ale represents a zinc concentration of but 879 parts per million.

Owing to the fact that children occasionally eat candy, foil and all, some experiments were made with a dozen individuals who tried this experiment upon themselves. They each ate pieces of foil an inch square, either chewing it up or swallowing it intact. In three cases efforts were made to recover the excreted zinc foil. In two cases this was accomplished, the foil being excreted within from 17 to 50 hours. The foil was not always recovered—in four cases no trace of zinc foil could be found in the feces. None of the twelve individuals who submitted to the experiment experienced symptoms of any kind nor was there any apparent metallic aftertaste.

Summary of Experimental Work—The preceding experiments show that with such zinc foil-wrapped foodstuffs as have been examined the degree of zinc contamination is relatively slight. With liquids such as ginger ale the quantity of zinc dissolved is proportional to time, temperature, degree of acidity, and oxygen dissolved. With solid foods the quantity of zinc accumulated is proportional to acidity, time of storage, and temperature, but the total quantity is far less than liquid foods.

The quantity of zinc dissolved by ginger ale after remaining in contact with the foil for two months is but 66.3 mg. per 100 cc., or 663 parts per million. When floating on the surface freely exposed to air, corrosion is more rapid and amounts to 87.5 mg. per 100 c.c. after two weeks of exposure, or to 875 parts per million. These, however, are extraordinary conditions. From a practical point of view the only degree of exposure that is likely to occur is that arising from contact of ginger ale in pouring from the bottle. However, in this case when the entire contents of the bottle were very slowly poured over foil of the same size as is ordinarily used on a bottle, the quantity of zinc dissolved was but 0.62 mg. per 100 cc., or 6.2 parts per million. (The normal content of seven brands of ginger ale examined varied from 0.5 to 2.3 parts per million.)

IN THE case of candy, the quantities of zinc accumulated were much smaller than was the case with ginger ale in contact with zinc. After storage for five weeks at room temperature, the maximum quantity of zinc accumulated was 65.1 parts per million, whereas the chocolate alone had a natural zinc content as high as 32.4 parts per million. "Acid drops" wrapped directly in zinc foil and stored for two weeks accumulated but 4.6 parts per million of zinc.

It is of interest to consider the foregoing experiments in connection with the results obtained in an extensive investigation of the hygiene of zinc by Drinker and her associates[4-11]. There it was shown[8-9] that relatively large quantities of zinc as zinc oxide or as zinc salts or organic acids can be fed to animals (rats, cats and dogs) without producing any harmful effects whatsoever. In these experiments rats ingested from 2 to 34.4 mg. of zinc per day as soluble salts, or as oxide; cats from 175 to 1,000 mg. of zinc as oxide daily; and dogs 500 to 1,000 mg. of zinc daily. During the course of the experiments (which lasted in the case of rats for 43 weeks, of the cats from 10 to 53 weeks, and of the dogs 15 to 19 weeks) the animals were healthy and normal as far as could be determined.

Furthermore, an examination of workers in the zinc industry[6]—workmen employed in the bag houses or packing rooms of zinc oxide plants, or engaged in the separation of zinc dust (blue metal), where exposure to zinc fume or dust is severe—showed that these men breathe and ingest large amounts of zinc daily. Individuals ingest as a result as much as 133 mg. of zinc daily. Careful physical examination of these employees demonstrated that their physical condition showed no variation from that of the average workman. These men

had been employed in an atmosphere particularly rich in zinc oxide, zinc sulphide, and fine metallic zinc dust for from 2 to 35 years with no acute or chronic illnesses in any way attributable to zinc.

These quantities of zinc are far in excess of what has been commonly thought to be harmful and carry convincing evidence of the latitude permitted in zinc ingestion without the production of ill effects. Furthermore, the quantity of zinc which naturally occurs in food is so high that one may ingest in a single meal as much as 200 mg. of zinc[10], while the normal daily intake usually is in the neighborhood of 15 mg.

The normal degree of contamination which the preceding experiments with zinc foil have shown to occur (6.2 mg. per liter of ginger ale, or 65 mg. per kilogram of chocolate) are small in comparison and constitute a negligible factor in the daily intake of this metal.

These investigations were carried on in co-operation with the Bureau of Chemistry and Soils of the U. S. Department of Agriculture. It is a pleasure to record the fact of this co-operation, and particularly to acknowledge the criticism and interest of Dr. F. C. Blanck in this connection.

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Facts About CANNED FOODS That Demand Thought

Exports Only Three Times Size of Imports—Nearly Half of U. S. Imports Are Italian Tomatoes

BECAUSE of the great size of the domestic canning industry, there has grown up a belief that ample supplies of canned foods are available without recourse to foreign production. Exports are generally thought of as far larger than imports. Actually, they are only about three times as large.

Production of canned tomatoes in the United States totaled 482,200,000 pounds in 1926, 669,989,000 pounds in 1927, and 807,455,000 pounds in 1928. That of canned peas amounted to 531,270,000 pounds in 1926, 388,080,000 pounds in 1927, and 435,468,000 pounds in 1928.

United States imports and exports of canned foods are summarized as follows:

United States Imports and Exports of Canned Foods

(Thousands of pounds)

Class	1926		1927		1928	
	Imports	Exports	Imports	Exports	Imports	Exports
Meats	22,784	15,599	35,669	16,601	55,155	14,693
Milk	1,663	114,549	2,623	102,935	2,608	115,551
Fish	36,316	130,233	37,525	123,571	48,841	135,298
Vegetables	113,945	71,347	120,149	80,857	112,300	91,164
Fruit	3,138	233,749	2,095	247,855	2,677	305,762
Total	177,846	555,477	198,061	571,819	221,583	662,470

The statistics compiled by the U. S. Department of Commerce indicate a possibility of improving conditions in the domestic industry by supplying at least a part of the canned foods which are usually imported. In a large number of cases, however, imports fill a place not occupied by domestic products and are largely in the nature of luxuries not produced commercially in this country.

Topical and geographical analysis of these import figures for 1927 and 1928 produces the interesting table shown on the following page.

In commenting upon these data, Carl H. Boehringer, of the U. S. Commerce Department's Foodstuffs Division, called attention to the fact that no very marked changes in imports of canned foods into the United States occurred during 1928, with the exception of large increases in canned meats and appreciable gains in evaporated milk, canned pineapple, and canned crab meat, decreases being shown for condensed milk, tomato paste, and canned lobster.

Canned Meats Chiefly Beef From South America—Statistically there is no separation of the varieties of canned meats imported, but inasmuch as most of the imported meat comes from Argentina, Uruguay, and Paraguay—essentially beef-producing countries—it is believed that the canned meats consist largely of canned beef. These South American countries, as well as Brazil, all increased their shipments in 1928, as compared with 1927. Canada also shipped more canned meat into this country last year, while imports from the United Kingdom fell off decidedly. Total imports increased by 57.1 per cent, as compared with 1927. Those in 1926 totaled 22,783,828 pounds.

It is generally believed that increased imports of canned beef indicate a lower production of that product in this country, because the supplies of "canners' stock"

have become less at the butchering centers during recent years.

Gain in Imports of Condensed Milk Equal to 1 Per Cent of Domestic Production—The imports of condensed milk more than doubled last year, increasing by 103.5 per cent as compared with 1927, while those of evaporated milk decreased in volume by almost one-third (30.2 per cent). On a percentage basis, the increase in condensed milk imports appear large, but the actual amount is small and constitutes less than 1 per cent of the domestic production. All of the gain is due to increases from the Netherlands and Canada, which, judging from the value per pound, consists largely of condensed skimmed milk from the Netherlands and evaporated whole milk from Canada. Imports of condensed milk in 1926 totaled 342,969 pounds, and those of evaporated milk 1,320,498 pounds.

Canned Crab Meat, Lobster, and Sardines Are Main Fish Products Imported—Japan increased its shipments of canned crab meat to this country by almost 50 per cent in 1928 as compared to 1927. The total import from all sources increased by 53.3 per cent. Practically the entire amount of canned crab meat imported is from Japan. Total imports in 1926 were 8,308,180 pounds. Canada occupies the same relative position with respect to canned lobster, the total imports of which were a trifle (4.2 per cent) lower than in 1927. Imports in 1926 totaled 1,792,238 pounds.

Sardines in oil, largely from Norway, show a slight (1.3 per cent) increase, with most of the increase attributable to Norwegian shipments. The supplies of Portugese sardines decreased appreciably, while those from Spain increased. Compared with the total imports of sardines in oil of over 29,000,000 pounds in 1928, are the exports for 1928, totaling 80,000,000 pounds. The quality of the imported article is much higher than that of the exports, as is shown by the respective values per pound—23.01 and 8.12 cents. Imports in 1926 totaled 26,215,588 pounds.

Canned Peas Rise After Drop in 1927—Tomato Products for Ex-patriate Italians—A gain of 10.2 per cent in canned peas represents increased imports from Belgium and Italy, but receipts from these countries were less than in 1926. France shipped almost 100,000 pounds less of canned peas in 1928 than in 1926. Total imports from all countries in 1926 amounted to 1,992,555 pounds. With regard to peas, there is little or no apparent connection between domestic production and imports.

Imports of canned tomatoes (82,292,540 pounds in 1926) and tomato paste (18,077,858 pounds in 1926) both decreased in 1928—by 3.6 and 31.5 per cent, respectively—as compared with those in 1927, but apparently without any connection with the production of canned tomatoes in this country. It is generally believed that the canned tomato products—the bulk of which comes from Italy—are almost entirely consumed by the foreign-born population.

"Other canned vegetables" includes all products other than peas, tomatoes and tomato paste, and it is impossible to make any analysis of these other products. Though the total imports for 1928 were practically the same as for 1927—increasing by 0.9 per cent—both years represent a decrease of approximately 3,000,000 pounds from the 11,581,813 pounds in 1926. Consecutive poor growing seasons probably account for the lower imports.

Pineapples Continue as Outstanding Imported Canned Fruit—Imports of canned fruits other than canned pineapple are so small as to be negligible and they are not further classified. An increase of 27.8 per cent in imports of canned pineapple (3,137,810 pounds in 1926) is explained by increased receipts from Cuba, but with lower amounts from the Straits Settlements and Costa Rica. These increased imports probably are due to the increased production of the product in Cuba. The imports of canned pineapple are not very serious at present, when it is observed that the 1928 exports of this product totaled almost 55,000,000 pounds.

United States Imports of Canned Foods

Product and Source	(Pounds) 1927	1928
MEAT		
Canned meats, total	35,669,361	55,155,841
Argentina	16,130,932	26,814,730
Uruguay	16,857,110	22,657,501
Paraguay	1,430,450	3,086,359
Canada	351,045	949,779
Brazil	581,431	681,489
United Kingdom	204,431	9,701
Other countries	113,962	956,282
MILK		
Sweetened, total	506,224	1,130,539
Canada	81,965	527,606
Netherlands	344,829	553,802
Other countries	79,430	49,131
Unsweetened, total	2,117,182	1,477,931
Canada	1,323,290	50,993
Netherlands	740,970	1,360,077
Other countries	52,952	66,861
FISH PRODUCTS		
Canned crab meat, total	8,984,421	12,775,114
Japan	8,699,679	12,744,065
Other countries	284,742	31,049
Canned lobsters, total	1,780,293	1,605,986
Canada	1,579,512	1,473,150
Other countries	200,781	132,836
Sardines, packed in oil, total	26,760,722	29,329,450
Norway	19,931,322	22,329,920
Portugal	4,377,478	3,965,470
France	887,691	863,291
Spain	365,362	632,472
Italy	554,851	438,512
Other countries	644,018	1,099,785
VEGETABLES		
Canned peas, total	1,066,555	1,188,803
Belgium	510,964	594,930
Italy	141,529	193,828
France	135,205	98,236
Japan	10,233	18,107
Other countries	286,624	283,702
Canned tomatoes, total	96,241,952	92,732,091
Italy	94,917,289	91,740,967
Canada	1,099,732	644,581
Other countries	224,931	346,543
Tomato paste, total	14,353,599	9,817,456
Italy	14,337,047	9,816,700
Other countries	16,552	756
Other canned vegetables, total	8,487,303	8,562,401
Italy	1,718,316	2,268,871
Japan	1,908,785	2,066,351
Hong Kong	1,698,687	926,903
China	254,588	686,628
Netherlands	715,618	576,058
Belgium	483,975	519,986
Spain	294,103	438,518
Greece	573,564	368,096
France	437,945	249,209
Other countries	401,722	459,781
FRUITS		
Canned pineapples, prepared in all ways, total	2,094,971	2,677,291
Straits Settlements	1,505,551	1,286,483
Cuba	252,740	1,126,157
Costa Rica	306,741	206,700
Other countries	29,939	57,951

Finished goods ready for shipment

UNSOLVED PROBLEMS OF *Corrosion, Materials Handling And Applied Bacteriology* IN THE PICKLE INDUSTRY

By ROBERT DILLMAN
Libby, McNeill & Libby, Blue Island, Ill.

THERE are a great many products that come under the general classification of pickles, as understood by the public in general, but the pickle industry as a branch of the great commercial development of this country has for its basis the cucumber. Cucumbers are grown on a commercial scale in many states, the principal ones being Michigan, Indiana, Wisconsin, Minnesota, Illinois, Colorado, Iowa, Ohio, California, Missouri, Oregon, New York, Washington and Mississippi. They are grown on small patches by thousands of farmers, who contract with manufacturing companies or with so-called "salters" for the crop.

The larger manufacturing companies have numerous "salting stations" in the districts where they operate but there is a class of fairly small operators who simply buy the cucumbers from the farmers, salt them down and sell the resulting "brine stock" or "dill pickles" to any manufacturer who needs them. These small operators are the "salters."

Cucumbers are graded for purchase in various ways in the different districts. Some companies buy field-run stock and pay a flat price, but the majority use three grades, called "small," "large," and "nubs and crooks." The dividing line between the small and large usually is around 3 or 3½ in. in length.

Salting the Cucumbers—The cucumbers as received from the farmers are a perishable fresh product and the first operation is to transform them into a product that will keep. This is the salting operation, and it is by this means that the cucumbers become pickles. The salting stations are located in the cucumber-growing areas so that the raw material can be delivered in a good fresh condition. A salting station consists primarily of a group of wooden tanks (either cypress or pine, as a rule), a salt house, and an office and tool room. The whole may be inclosed in a building, but many times only the salt house and office are inclosed and roofed in.

Low Salting—There are two general classifications of salting, usually referred to as high salting and low salting, according to the quantity of salt used. The majority of low-salted pickles are "dill pickles," and are salted in barrels. The washed, large-size cucumbers, dill weed and spices are put in the barrel. It is then headed up, after which it is filled, through the bung, with a salt brine of about 8 per cent strength. A small quantity of vinegar may or may not be used with it.

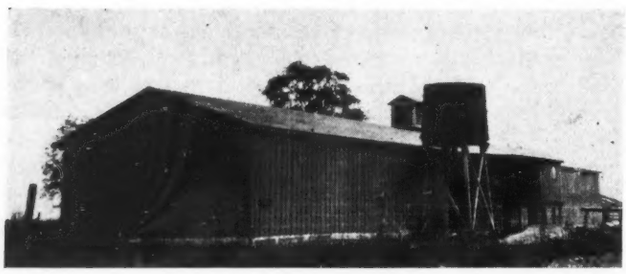
The raw materials used always carry lactic acid bacteria, and as soon as the process of osmosis causes the juice of the cucumber, with its starches and sugars, to enter the brine a lactic fermentation starts and carbon dioxide is formed. Some salters bung the barrel up tightly and allow the pressure due to the gas evolution

to rise and then subside again, but, on account of the fact that it is quite common for some barrels to blow up in this method, most of them leave a plug hole open in the head of the barrel until the formation of carbon dioxide is completed.

As soon as lactic fermentation starts, the acidity rises quite rapidly and the color of the cucumber starts to change from cucumber-green to the olive-green of the cured dill pickles. The white structure of the inside of the cucumber changes more slowly and it usually is several weeks after the fermentation has subsided before it has changed to the translucent appearance of the fully cured pickle. When this stage is reached, the lactic acid content will be about 1 per cent; the salt content, due to added brine, will be about 4 per cent; and salts from the cucumber itself will be about 1 per cent. The flavor of the dill and spices has permeated the whole cucumber and the delicious dill pickle, as purchased in the stores, is the result. The barrels are shipped from the salting stations to central points, where they are opened, the pickles sorted for size, repacked and shipped.

The low-salting principle, used in dill pickles, is sometimes used in making brine stock by putting only the cucumbers and brine in barrels and using the resulting product in the manufacture of sour or sweet pickles. Sometimes a similar product is made in tanks, using a little more salt, but most of the cucumbers not used for dill pickles are salted according to the high-salt method.

High Salting—In the high-salt method a small quantity of brine of about 10 per cent strength is put in the bottom of a tank and cucumbers and salt are added as the cucumbers are received from the farmers. The proportion is about 10 pounds of salt to 100 pounds of cucumbers, and the result is that the juice of cucumbers is drawn out by the salt and results in a brine of about 9 per cent strength. The lactic fermentation takes place here as it does in dill pickles, but the higher salt content controls it so that it reaches only about three-quarters of the acid content of dills. The salt content is gradually increased as the fermentation proceeds and is finally brought up to about 15 to 16 per cent.

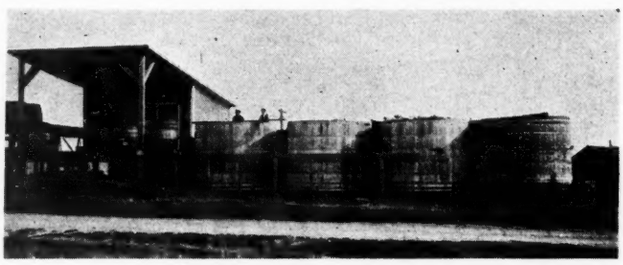


A closed type of salting station.

The same changes take place in color and texture as occur in dills but the cucumbers shrivel more, on account of the higher salt content. Unlike dills, this stock is not a palatable product, but must be manufactured into finished products and the real manufacturing part of the pickle industry concerns itself with this work.

It will be seen that pickle salting is really a bacteriological process and salt is used mainly as a control. As a bacteriological process it is subject to all the variations, contaminations and external influences of such a process. In the early days of the industry the salters trusted to Providence entirely, and had either good or bad luck as the case might be. Only in comparatively recent years has science entered the business and taken some of the guesswork out of it. It is well understood now that the acid formation is the most important point to watch, so that today many salters have acid-testing outfits of some kind with which to follow its progress.

If the acid formation is slow in starting, the potato bacteria will get a start and completely spoil the pickles. Starters and cultures were talked of some years ago and some people thought that bacteriologists would be able to give us a little bottle of "pure culture" which when added to a tank would make superior pickles a certainty. This was too much to expect, but the practical men in the industry, guided and aided by the bacteriologists, have worked this out in a very satisfactory manner.



An open type of salting station. Salt and tools are kept in the building. Note the olive casks on the receiving platform for salting the season's first receipts.

The practical starter is not unlike the method followed by the old-fashioned housewife in making bread. The first small receipts of cucumbers are put in barrels or olive casks and, in the warm weather usually prevalent when salting is done, the lactic fermentation always starts without any trouble. This is used just as yeast is used in bread and is added to the larger tanks as they are filled. After a few large tanks are working well, some brine from these is used in others just being filled.

A real problem, however, comes late in the fall or during spells of cool weather. No temperature control is possible on account of the cheap construction of the stations, and its cost would be prohibitive. As a result the fermentation sometimes is slow and the cause of much anxiety to the salter. Considering all these things, the degree of success that is attained by the industry as a whole is really remarkable.

Manufacture of Finished Product from Brine Stock—Salting the cucumbers is carried on in inexpensive stations on account of the peculiarities of the business, but the manufacture of finished pickles from the raw product or brine stock is carried on in modern factories. The brine stock is transported from the salting station to the finishing plant in privately owned wooden tank cars by the larger companies, or in barrels when tank cars are not available. The stock usually is sorted to size and for grade at once, and stock not immediately needed is stored in large tanks in the same brine in which it was cured and shipped. The sorting is largely a hand operation, although many attempts have been made to do it mechanically. Revolving drums and shaking screens of various designs have been tried out, but as a rule these are only aids to hand sorting.

The next step in the manufacture of pickles from brine stock is the removal of a large part of the salt content and plumping up the pickles to give them an attractive appearance. This is called "processing." The processed stock contains from 2 to 4 per cent of salt, according to the ideas of individual manufacturers, and a very small amount of lactic acid. This is accomplished

Packing finished pickles into bottles.

by putting 2,000 to 4,000 pounds of brine stock in a wooden tank of from 700 to 1,000 gallon capacity, and with it a carefully calculated quantity of water. This is heated with steam, stirred constantly, and the salt content is reduced by dilution.

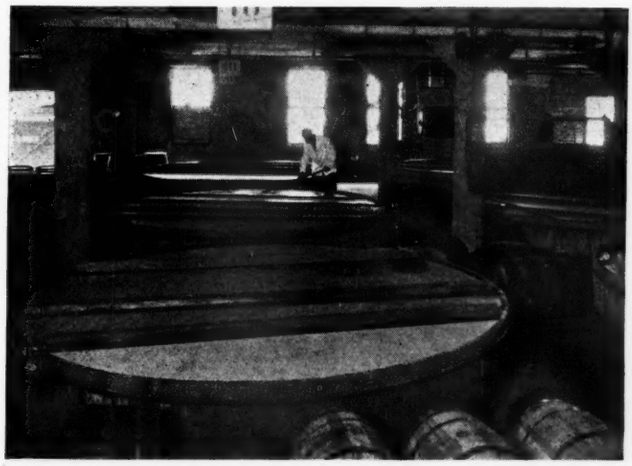
With processed stock as a base, sour pickles are made by adding spiced or flavored vinegar of from 5 to 6 per cent acetic acid strength, and sweet pickles are made by further adding a sirup of sugar and vinegar spiced to suit the taste of the individual packer.

In addition to cucumbers, cauliflower and onions are salted by methods adopted to suit the individual produce that are slightly different from the method employed for cucumbers. Salted onions and cauliflower are processed in the regular way and are mainly sold mixed with cut cucumber pickles as sweet mixed or sour mixed pickles.

Sweet relish is a product similar to sweet mixed pickles but is chopped into smaller particles. There are also a number of specialties, such as chow chow and sweet chow chow, which have for their basis the products just described, but to them are added special dressings.

The finished pickles are packed in three ways, in wooden cooperage, glass containers and tin cans. The wooden barrel probably was the original package and it was followed later by the glass bottle with a cork closure and more recently with metal caps of various kinds. The distinguishing characteristic of these two types of packages is that they are simply filled and sealed. No sterilization, pasteurization or heat treatment is used. The tin can is a more recent innovation, and it presents new problems. It cannot be treated like barrels or bottles on account of the corrosion factor, but must either be exhausted by heat or sealed under a vacuum to exclude the air. Both methods are used with success and it is a question as to which is the more satisfactory. With the method of exhaust by heat, quick cooling is essential. Attempts have been made to coat the interior of the cans with paraffin wax and eliminate the use of an exhaust or vacuum closing machine, but they have not been a success. The present tendency is away from barrels and kegs and toward glass jars and tin cans. The quart jar is, perhaps, the favorite at the present time.

Pickle storage tanks; the workman is removing the scum of Mycoderma, a wild yeast that destroys the lactic acid.



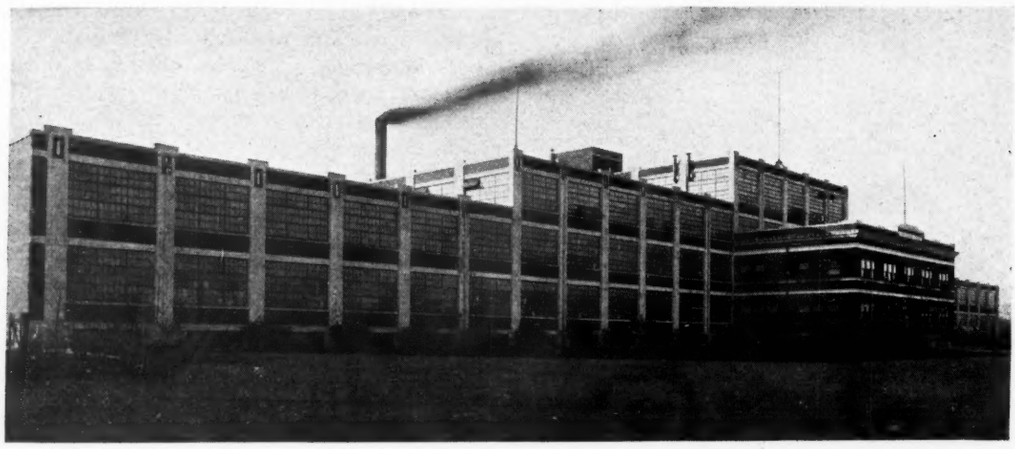
Manufacturing Problems and Efforts for Their Solution—The first problem is that of salting high-grade brine stock. As this is based on a bacteriological process it is theoretically subject to very accurate technical control, but for many reasons no such control is practiced. The weather and the salt used are the actual controlling factors, in addition to the use of starters of fermenting

Crates of sorted pickles on a skid are economically handled by an electric truck. Brine, dripping from the crates, presents a corrosion problem when steel equipment is used.

brine. Fortunately, the weather is fairly satisfactory for a greater part of the time, but the last tanks to be filled in the fall are the source of some worry.

Brine heaters that would circulate the brine from a tank of pickles through a heating coil and back to the tank have been suggested as a means of hastening sluggish fermentations, and it may be possible to work this out successfully. They could be portable, coal or oil fired, and one of them would serve a number of stations. They would possibly be of some value at far northern stations, where the weather gets cold quite early in the harvesting season.

The second problem is handling and conveying the brine stock. It is a very wet job and, more than that, the brine contains much salt and a considerable quantity of acid. Wooden tank cars and wooden barrels are good for shipment, but in the plant operation the problems brought about by the brine are great, for it readily eats concrete floors so that asphalt or wood must be used. The pickles are removed from tanks or tank cars by means of cotton dip nets and are trucked around in wooden crates, baskets or barrels. In some cases elec-



The pickle and condiment plant of Libby, McNeill & Libby at Blue Island, Ill.

tric trucks are used with considerable success to transport these containers, although the brine is hard on the steel equipment. Belt conveyors are used considerably and are constructed mostly of wood and use rubber belts. A possibility of considerable saving and improved operation exists in the handling of material in this industry.

The third problem is that of handling liquids. Vinegar, sweet pickle sirup, and the like, are very hard on iron piping and its use with them is very unsatisfactory. Wooden pipe lines gave a measure of success but valves, fittings and pumps were still a problem. Copper and brass are out of the question since they form objectionable compounds with the products. This problem is now helped a great deal by such alloys as Duriron and some of the high chromium stainless steels. These give very satisfactory service but are very expensive and difficult to work. They are of much value, however, to the pickle industry. Duriron cannot be machined but must be ground, and stainless steels are very hard to machine, so that an alloy with their non-corrosive properties but with the machinability of iron or steel would be a wonderful thing for the industry.

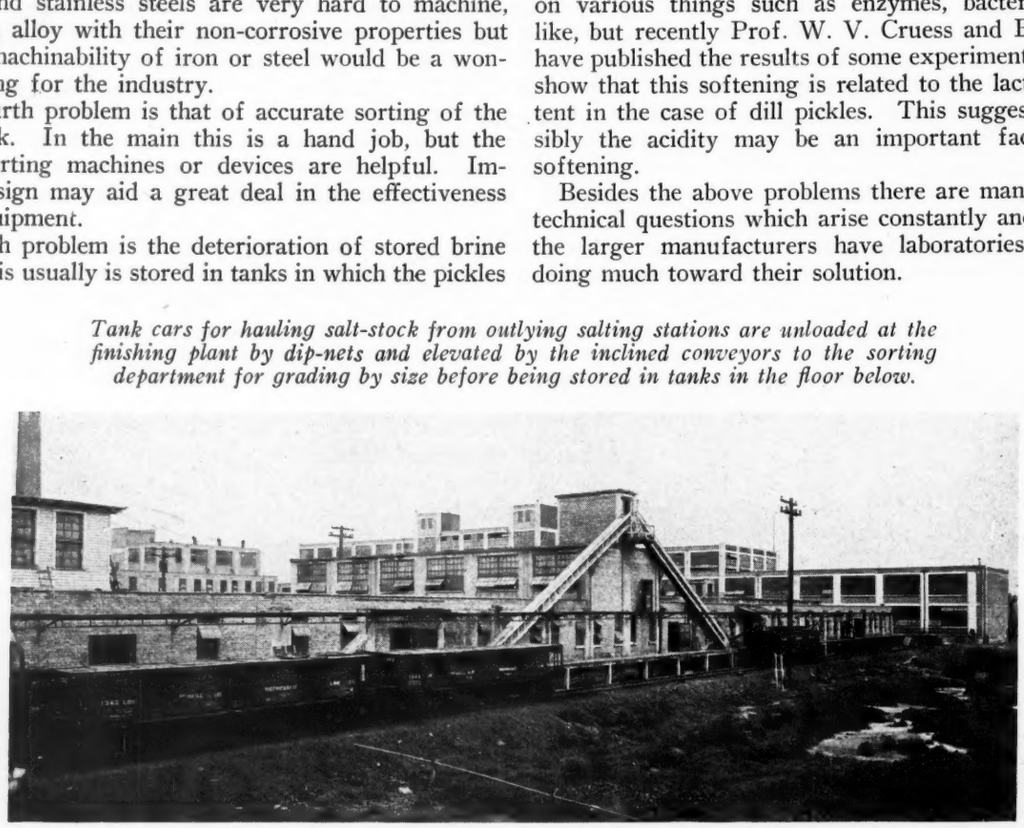
The fourth problem is that of accurate sorting of the brine stock. In the main this is a hand job, but the present sorting machines or devices are helpful. Improved design may aid a great deal in the effectiveness of this equipment.

The fifth problem is the deterioration of stored brine stock. This usually is stored in tanks in which the pickles are kept under the brine by means of wooden covers. The exposed brine surface is an excellent culture medium for wild yeasts and they grow into a heavy scum, consuming lactic acid from the brine and oxygen from the air. This depletion of acid will cause the stock to spoil if it goes far enough. The solution seems simple, for all that is necessary is to seal out the air, but this presents great difficulties in practice. Coating the surface with paraffin gives some relief but has many drawbacks. A flexible wax with the properties of paraffin would be a big help. If the tanks are located out in the open air this scum does not form but the dilution of the brine by snow and rain is just about as undesirable.

The sixth problem is found in the softening of apparently good finished pickles or brine stock. There is no decomposition apparent, as usually interpreted, and the flavor is not affected, but the pickles simply lose their crispness and become unsalable. This has been blamed on various things such as enzymes, bacteria, and the like, but recently Prof. W. V. Cruess and B. E. Lesley have published the results of some experiments tending to show that this softening is related to the lactic-acid content in the case of dill pickles. This suggests that possibly the acidity may be an important factor in this softening.

Besides the above problems there are many individual technical questions which arise constantly and several of the larger manufacturers have laboratories which are doing much toward their solution.

Tank cars for hauling salt-stock from outlying salting stations are unloaded at the finishing plant by dip-nets and elevated by the inclined conveyors to the sorting department for grading by size before being stored in tanks in the floor below.



AN ENGINEER

[THE FIRST OF TWO ARTICLES]

Looks At

Pressure Sterilization

By W. A. FLANNERY

Superintendent of Canning Department, Foods Division
Val Blatz Brewing Company
Milwaukee, Wis.

THERE is no doubt that our present standards of quality and appearance of canned foods, with the exception of evaporated milk, have been built up around what is called the still-cook process. Evaporated milk is an exception, for it has been found that this product needs agitation during some period or periods of the sterilizing process.

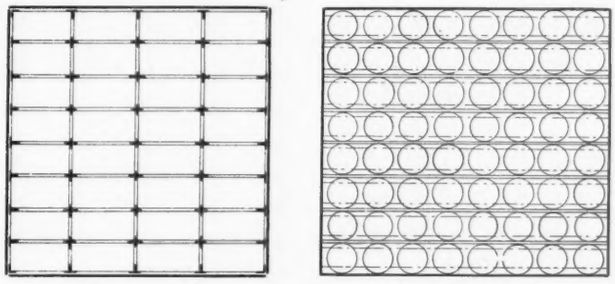
Starting from the most simple form of processing known, that of the open bath of boiling water, those who sought to improve their methods or obtain a product which was more certain to keep, changed from the open bath to the closed-retort process. The time element was shortened as the temperature was increased. A closed retort was simple and easy to handle, and produced results which started the canning industry along the path to success. Time has passed and as more modern types of machinery have been developed the cook room has had its share of improvements, but in our efforts to develop better equipment we find that we have been tied to certain standards established in the early history of the industry and developed around the action of the time-tried still process in the retort.

There was once a feeling among owners of manufacturing industries that the power house was a necessary evil—one that was expensive but that must be tolerated. The cook room of the canning factory is somewhat in the same class. It is an expensive place to keep up and operate but we must have it. However, a careful study of its requirements and the placing of intelligent men in charge will reduce the operating cost just as surely as was done in the power house. All of this applies irrespective of the type of equipment used.

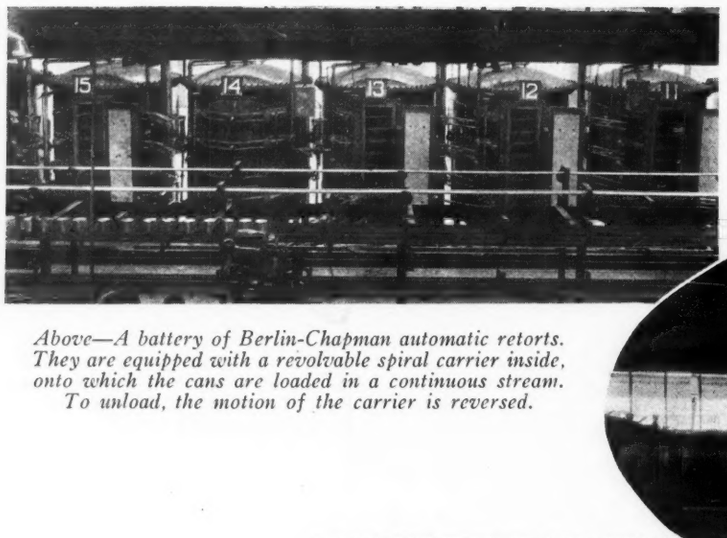
Cook room equipment can be divided into three general classes: (1) The still-cook retort with hand-loaded and unloaded baskets; (2) the still-cook retort automatically loaded and unloaded, and, (3) the continuous cooker. The still-cook retort can also be divided into two classes in which the product is cooled in the retort itself and in which the product is removed and cooled in some auxiliary equipment after the retort is blown down.

The first type of equipment is familiar to all canners and needs but little description; however, let us discuss and analyse it and determine what its really good points may be. One of the first considerations for a piece of machinery or equipment, regardless of its first cost, is its flexibility or adaptability to the requirements of the user. Many small canners use several sizes and shapes of cans. No one size may be run all day. The output, in total number of cans, may be quite large but that of any individual size may be comparatively small. The can sizes may range from No. 1 to No. 10. On the other hand, a large packer may use but one or two sizes of cans with an immense run of each size. In either case all sizes of cans must be taken care of as they come. With these thoughts in mind it must be agreed that the still retort, with the hand-loaded and unloaded baskets, is the most flexible equipment one can install. The human hand and the retort basket will take any can presented and any empty retort is suitable for use.

If for any reason it is necessary to pressure-cool, this can be done in the retort. However, if the cans are of small sizes and the sterilizing process is not at a temperature high enough to create too great an internal pressure in the can and cause a permanent distortion sufficient to damage it, then as soon as the heat application is over, the retort can be "blown down," opened and the baskets sent to the auxiliary equipment for cooling, leaving the retort ready for the next filling of whatever size cans are waiting to be processed. All this is quite handy and seems to be in favor of the old still retort. It has, however, the unfavorable feature that it takes quite a few men to handle the operations from the time

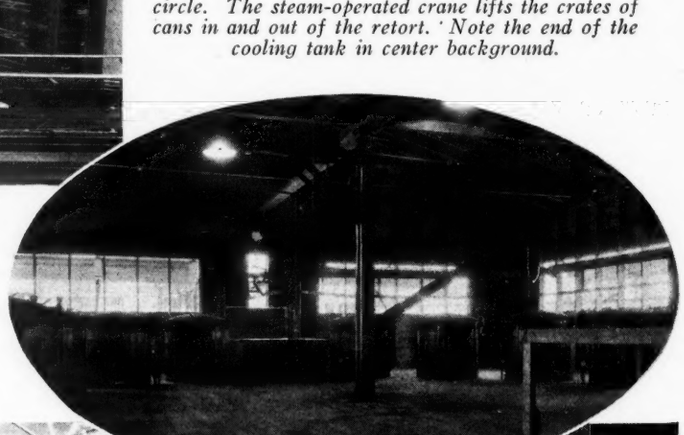


Showing the design of the basket for holding the cans in a Pet Milk Company retort. Angle bars and flats are largely used for its construction. The basket is shown loaded with cans.

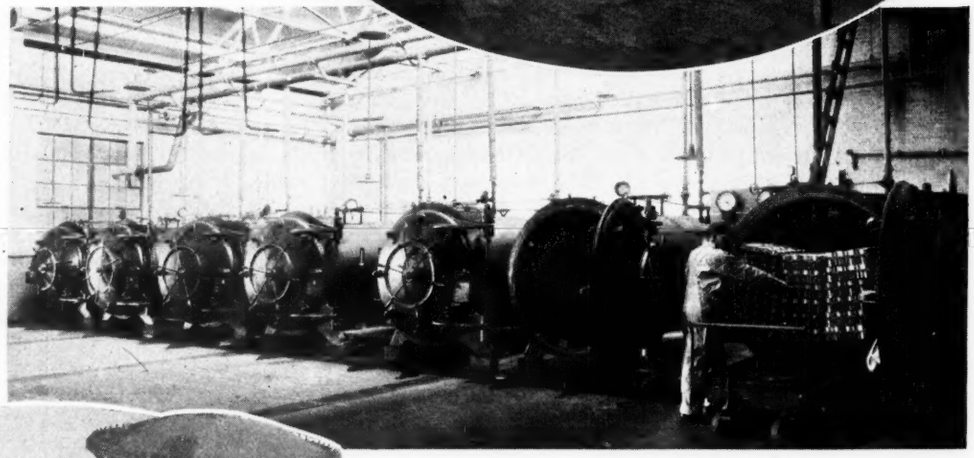


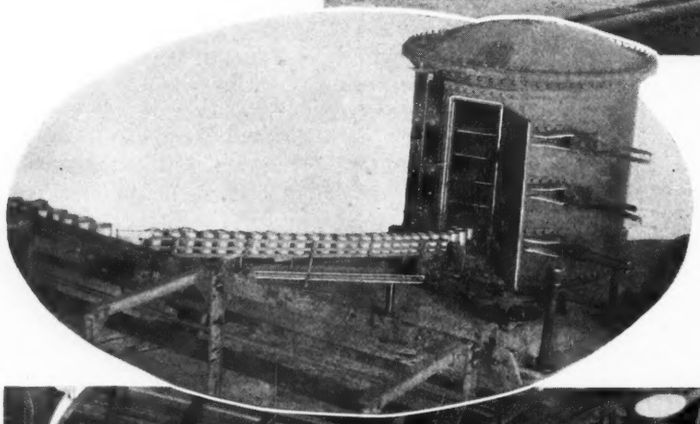
Above—A battery of Berlin-Chapman automatic retorts. They are equipped with a revolvable spiral carrier inside, onto which the cans are loaded in a continuous stream. To unload, the motion of the carrier is reversed.

Below is a cook room with ordinary retorts in a circle. The steam-operated crane lifts the crates of cans in and out of the retort. Note the end of the cooling tank in center background.

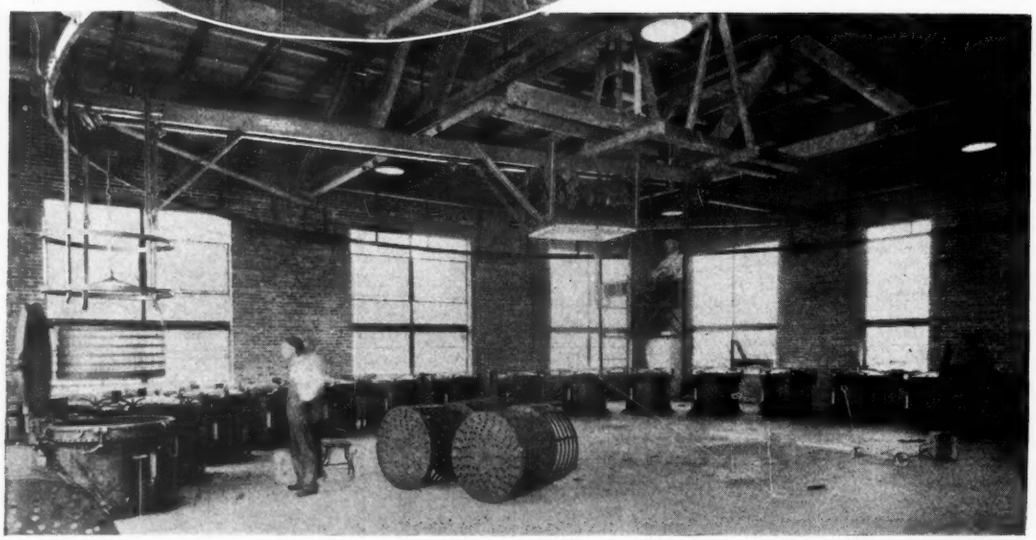


A battery of large Troyer-Fox horizontal retorts at the new De Kalb (Ill.) plant of the Midwest Canning Company, a subsidiary of the California Packing Corporation. The method of loading the retort shows how the influence of far Western practice is traveling east.





A close-up view of a Berlin-Cnapman automatic retort when the operation of loading has just been started. Cans are taken in and discharged without handling.

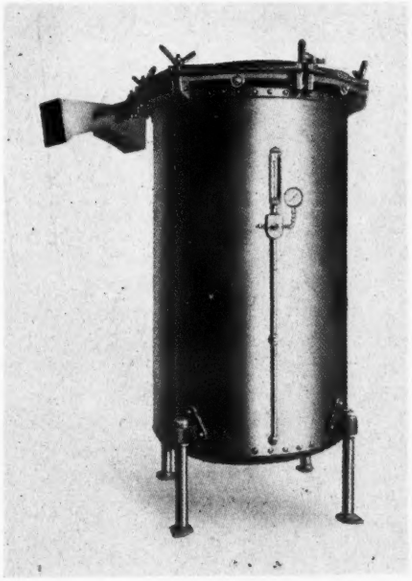


Retort room in the Morton (Ill.) plant of Dickenson & Company, subsidiary of Libby, McNeill & Libby. The Dickensons were the first to abandon the steam crane for the electric crane with its greater speed and easier control. The cage above the crate of cans is necessary to avoid uncontrolled swinging of the suspended crate when the crane is in operation.

the cans leave the closing machine until they are stored away in the warehouse and retort baskets are nearly everywhere in the factory.

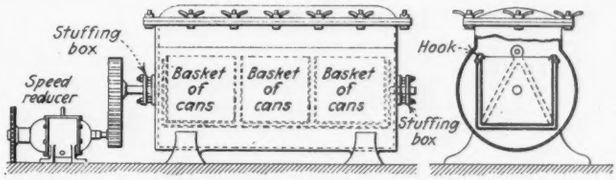
An improvement on this method of handling the cans has been developed which still leaves us with our old reliable retort ready to take any can presented to it. This is in the form of can runways from the closing machine running to a device patterned somewhat after the idea of an automatic casing machine and is probably a development of the Pet Milk Company. It is a reservoir where the cans stack up until they are allowed to run into a special type of crate or basket which, after being filled, is trucked away to the retort. These crates are necessarily square or oblong and consist of a number of short can tracks all stayed together. One end is open so that the cans can run into the crate when it is placed in contact with the loading reservoir. To unload, it is run up to another frame which tilts it and lets the cans run out onto a conveyor table and into the runways which carry the cans to the labeler or the boxer.

This equipment can be adapted to the round vertical or horizontal retort but quite some space is wasted due to the shape of the basket. It is best adapted to the horizontal square retort. In the plants where this type of equipment has been used its success has been due to the fact that they handled a large number of one single size of cans. In a plant where a number of different sizes of cans were handled it would be very inconvenient to put up the different sized can runways and to have the several different sizes of baskets necessary. There also would be required each of the several different sizes in the loading and unloading devices, all of which take up much room when not in use. In a plant of a size sufficient to enable the packer to have certain lines of machinery equipped for this system and large enough to permit these lines to run steadily throughout the season, it has a real advantage over the hand-operated equipment. After the can is once in the retort the sterilizing action does not differ from the ordinary retort. There is no difference in process, it is only a difference in the method of loading and unloading the retort and, from this standpoint, it saves labor.



A Berlin-Chapman retort. This type of retort is the simplest form of pressure sterilizing apparatus. Although provided with legs on which it stands, it rests on a sub-floor. The retort room floor usually is built as high as the thermometer pocket

An improvement over this type is the automatically loaded and unloaded retort of the Berlin-Chapman Company. In this type there is the usual battery of retorts of the vertical type except that instead of having the top head used as the loading and unloading opening these operations are due through a long vertical slot—



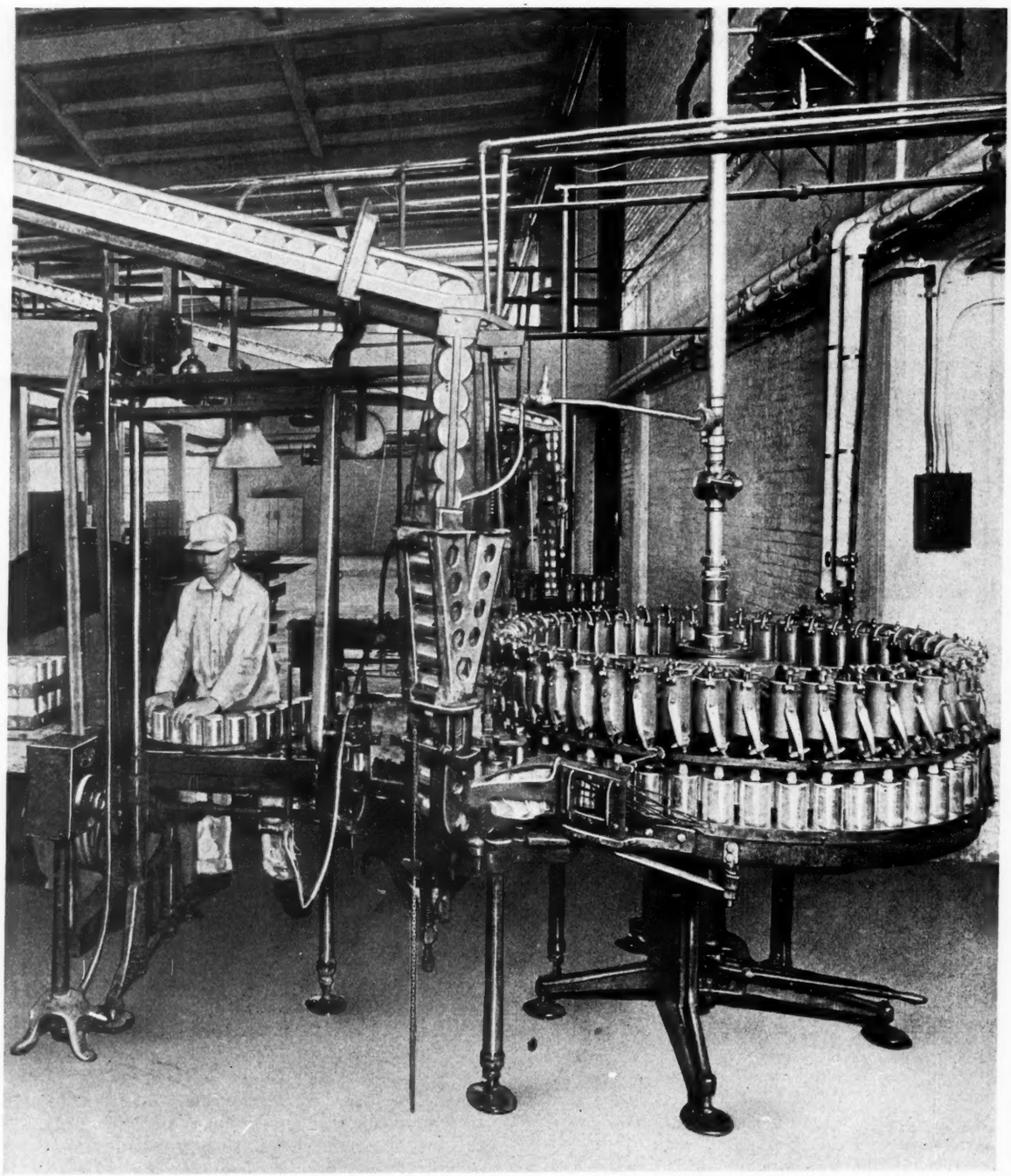
A type of mechanically loaded retort that is rarely seen. It was devised by the Pet Milk Company to provide mechanical loading and unloading, and an agitating cook during sterilization. The basket of cans is hoisted out of the cradle that carries it.

in the side. Inside the retort is a spiral form of platform which is revolved by means of outside connections. A can track running from the closing machine carries the cans to a position in front of the retort to be loaded. Here they are taken up by a cross-conveyor attached to the main conveyor. During the period of loading the outer or discharge end of this cross-conveyor extends into the retort and the spiral platform is caused to revolve. Starting with the cross conveyor in its highest position, at the top of the platform, the cans pass in and are landed on the platform which, by revolving, carries the can away from the conveyor. This leaves the space in front of the conveyor clear for the next can. At the same time the end of the conveyor lowers following the action of the spiral platform. In this manner the cans are placed in an upright position upon the entire platform surface.

When the retort is filled the conveyor is withdrawn, the front of the retort closed, the revolving action of the platform stopped and the sterilizing process started. The cross-conveyor is moved to the next retort and filling operation again started. The process or cook is then carried out in the same manner as in the ordinary still-cook retort. When the cook is finished, the cooling is done as is regularly carried out in any retort, after which the front of the retort is opened for unloading. This is done in the reverse manner from loading by a second cross-conveyor and main conveyor. The equipment can be made to operate very successfully and is a positive labor saver. In a plant where a given size of container can be constantly used the equipment has decided advantages, but it lacks the flexibility of the hand-filled and emptied baskets. As regards capacity we find that for a given cubical content of retort it does not have the same capacity as the hand-filled baskets. This is due to the fact that the platform takes up a certain amount of room and the cans must have some headroom to allow the free movement of the loading and unloading device.

During the period of processing with this type of equipment there is no agitation of the product and therefore there is no acceleration to the heat penetration, Consequently there is no chance to shorten the process to compensate for the reduced capacity just described. But by virtue of its non-agitating cook we are able to reproduce the old standards of product. To the canner with an established standard this means something.

Rôle of Homogenization, Agitating,



Filling the concentrated, homogenized and standardized milk into vent-hole cans

Cook, and Salt Balance In Controlling Quality OF EVAPORATED MILK

By H. H. SOMMER
Professor of Dairy Husbandry
University of Wisconsin

EVAPORATED MILK is concentrated milk preserved by heat sterilization in hermetically sealed cans. By federal law it is required to contain not less than 7.8 per cent milk fat and 25.5 per cent total solids, with the further provision that the sum of the fat and total solids percentages must not be less than 33.7. Since the sum of the minimum figures for fat and total solids amounts to only 33.3 (7.8 + 25.5), the last requirement means that the product cannot approach both minima simultaneously; the difference between 33.3 and 33.7 must be made up either on the fat or on the total solids or partly on both. This makes the standard somewhat flexible. The following figures illustrate the two extremes which will just satisfy this standard:

	Fat	Total Solids	Solids-Not-Fat	Fat + Total Solids
Case 1	7.8	25.9	18.1	33.7
Case 2	8.2	25.5	17.3	33.7

In Case 1 the 0.4 is made up on the total solids, while in Case 2 it is made up on the fat content. It will be noted that an increase of 0.4 per cent in the fat content enables a reduction of 0.8 per cent in the solids-not-fat content; in other words, this standard places twice as much value on a pound of fat as on a pound of solids-not-fat. In actual practice the fat is considered even more valuable, with the result that most manufacturers of evaporated milk tend toward the figures shown in Case 1.

Evaporated milk is accurately standardized by all manufacturers and competitive conditions cause them all to approach the minimum figures rather closely. The margin of safety allowed with respect to the federal standard varies somewhat; but it is a fair presentation of conditions to say that the composition usually falls within 7.81 to 7.90 per cent fat and 25.9 to 26.1 per cent total solids.

From the above description and definition of evaporated milk it is at once apparent that the manufacture of this product involves (1) concentrating, (2) testing and standardizing, (3) canning, and (4) sterilizing. However, the process is not so simple as this outline might indicate; besides the composition, the viscosity, color and flavor of the product must be standardized. Throughout the manufacture of the product, conditions must be carefully controlled; in fact, there probably is no other manufactured dairy product that requires more careful control of details than does evaporated milk. It is the aim of this paper to present some of the problems and discuss the measures used to control them.

Fat Separation—In the canned evaporated milk there is a tendency for the fat to separate out at the surface. If this occurs and if the can stands undisturbed for a period of several weeks or more, this layer of cream becomes quite firm and leathery. When such a can is then opened, the broken pieces of the leathery cream layer float on top, and when the can is emptied, there is a distinct ridge of fatty material adhering to the side of the can at the former level of the surface. The appearance of the empty can and of the product is not favorable.

This defect is guarded against by homogenizing the milk and by developing the proper viscosity in the product. The concentrated milk on leaving the vacuum pan, usually at a temperature of 135 to 145 deg. F., is homogenized at 2,500 to 3,000 pounds pressure per square inch. This breaks up the fat globules so that the majority of them are about one micron in diameter, which is about one-sixth the diameter of the average fat globule in normal milk. According to Stokes' law, the velocity of rise of the globules is directly proportional to the square of the radii of the globules and inversely proportional to the viscosity. According to this, if no new factors enter in, the globules 1 micron in diameter require 36 times as long to rise the same distance as those 6 microns in diameter.

Where difficulty is experienced even in the homogenized product, a second homogenization is resorted to. This is rarely done, but in the light of recent information, it may be desirable. It has been found that while the first homogenization breaks up the fat into small globules, these small globules cohere in clusters to a large extent. These clusters will rise more rapidly than individual small globules would. The second homogenization, even at a comparatively low pressure, breaks up these clusters, and thus should have an appreciable additional effect in preventing fat separation. This second homogenization may be done with a second machine or the entire operation may be carried out in a so-called "two-stage" homogenizer.

The other factor affecting the rise of fat globules is the viscosity of the product. This is controlled by so fixing the sterilizing conditions as to produce the desired viscosity. More will be said about controlling the viscosity later in the paper.

It is likely that a third factor enters into the question of fat separation. There is evidence in support of the

idea that proteins are adsorbed on the surface of the fat globules. This would tend to weigh down the fat and keep it from rising. This is especially true if the proteins are fixedly deposited by coagulation. There are indications that this actually occurs. The writer has seen a few instances where the fat separated out at the bottom of the can, not as fat alone but as a fat rich mass resembling cream cheese. Such an occurrence would be explainable on the above basis; so much protein was deposited on the fat globules that the mass so formed was actually heavier than the serum and hence settled out.

The Sterilizing Process—In the sterilizing of evaporated milk the cans must be in motion during the heating; otherwise the heat penetration is slow, but a still more important reason is that the milk would otherwise scorch onto the cans. During the cooling also the milk must be in motion lest "skin" formation take place. As a result all sterilizing processes for milk, whether batch or continuous, provide for the gentle agitation of the milk in the sterilizer. Only the batch process will be described here since my main interest in this discussion is centered in the milk and not the mechanical aspects of the processes.

The filled cans of the concentrated, standardized, homogenized milk are placed in a metal basket which fits into a "reel" in the sterilizer. When the sterilizer has been loaded it is closed and we are ready to apply the steam. In the sterilizing processes in use by different manufacturers a number of points of difference occur. These points of difference may be outlined as follows:

1. Cans surrounded by
   (a) Steam
   (b) Water
2. Rate and manner of applying the heat:
   (a) Steady come-up in temperature to the holding temperature in from 10 to 30 minutes.
   (b) Interrupted come-up with short holding periods at each interruption to allow heat penetration.
3. Temperatures used range from 235 to 248 deg. F.
4. Manner of "reeling."
   (a) Speed of the "reel"
   (b) Reeled throughout
   (c) Reeled during come-up and first few minutes of holding period; no agitation during greater part of holding period; reeled during cooling.
   (d) Interrupted reeling or "jerking the reel" during the holding period.

Various combinations of these are found in use. It will be sufficient for our purpose here to dismiss each with a statement and arrive at the practices most commonly used. Heating in water is preferable to heating in steam because it enables more uniform heating throughout the sterilizer. A steady come-up is preferable because in any case the rate of heat penetration depends upon the temperature gradient; interrupted heating merely will expose the milk to more heat at temperatures that are ineffective for sterilizing. A rapid come-up in general is preferred for the same reason; 15 to 20 minute come-up periods are commonly used. Where a 10-minute come-up is used an additional variation is practiced: viz., coming up to a temperature 5 to 8 deg. higher than the desired holding temperature, and maintaining this higher temperature for 1½ minutes, then dropping back to the holding temperature. This is on the theory that a temperature gradient of 5 to 8 deg. (depending on the size of the can) maintained for 1½ minutes will effect the desired temperature in the center of the can.

The temperatures used cover quite a range and in any case must be varied to suit the behavior of the milk. Formerly 230 deg. F. was used. In recent years the tendency has been to use higher temperatures and a shorter holding period. A temperature of 240 deg. F. is very commonly used and the time required to produce a sterile product at this temperature usually is considered to be 15 minutes. However, this is affected somewhat by the come-up used and the types of bacteria that may be present in the milk. For the purpose of this discussion we may consider this the minimum safe sterilizing temperature treatment.

"Skin" Formation—When milk is heated in an open dish a "skin" forms on the surface. This is due to an irreversible dehydration (coagulation) of the proteins at the surface. If milk is inclosed in cans the air above the milk soon becomes saturated with water vapor and no such evaporation can take place except in the cooling process. When the cold water is turned into the sterilizer, the parts of the cans occupied by air and water vapor will cool more rapidly than the parts of the cans occupied by the hot milk. The result is that the water vapor condenses on the inside of the can, and evaporation takes place from the surface of the hot milk.

Unless the surface is changed by agitation, "skin" formation results. Obviously the remedy is to have the "reel" in the sterilizer turn over more rapidly. The agitation must be rapid enough for the rate of cooling used if "skin" is to be avoided. "Skin" in evaporated milk is easily detected by pouring the milk through a fine strainer.

A milk of low viscosity will be more likely to give trouble from "skin" formation than a more viscous product. This probably is to be explained on the basis of slower diffusion of proteins to the surface in the viscous product or it may be due to the fact that the proteins are already coagulated to a greater extent in the more viscous product.

The remedy for "skin" formation is (1) to produce a more viscous product, and (2) to speed up the "reel" during the cooling.

Heat Coagulation and Control of Viscosity—From the above discussion of the sterilizing process it must not be inferred that any manufacturer can exactly fix his sterilizing process for all time; the process must be varied in time or temperature or both to suit the behavior of the milk.

As a result of the heat treatment in the sterilizing process, a coagulation occurs. To a certain extent this coagulation is desirable; it makes the milk more viscous, which, as has already been seen, is important in preventing fat separation. The proper viscosity also is desirable because it gives the product a desirable appearance of richness. The ideal condition is one in which the milk happens to coagulate to the proper extent for viscosity purposes at a temperature treatment just slightly over the minimum safe treatment for sterilizing purposes. Any departure from this ideal toward either extreme is undesirable; if the coagulation occurs too slowly the heat treatment must be increased to produce the desired viscosity, with the result that the milk is darker in color and has a more pronounced cooked flavor; if the coagulation occurs too readily the product will be excessively viscous or even curdy and unmarketable when given a heat treatment that will preserve the milk.

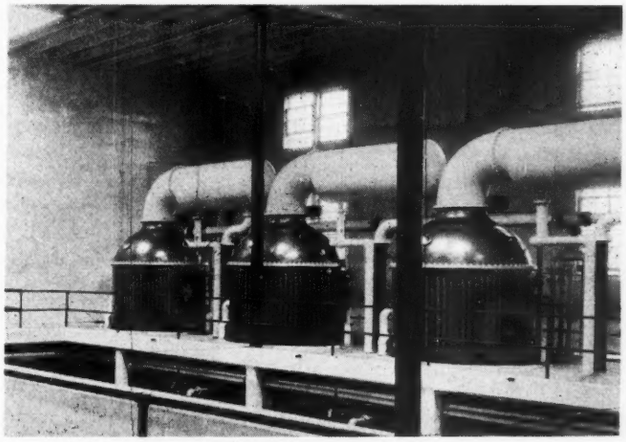
Milks differ decidedly in their tendency to coagulate

when heated, so that the industry constantly finds the product deviating from the above-mentioned ideal condition, unless the tendency to coagulate is controlled. Of the two extremes, too slow coagulation and too rapid coagulation, the former is least serious because it means only a slightly inferior product, while the latter means a decidedly inferior product or even one that is unmarketable. However, both are sufficiently important to make control desirable.

Formerly the difference in the heat coagulability of milk was assumed to be due to the acidity of the milk. The remedy which had come into quite general use was the use of sodium bicarbonate. In 1928 Sommer and Hart undertook a systematic study of the factors involved. These studies were continued over a period of several years, both in the laboratory and under commercial application. The results were published in Wisconsin Research Bulletin No. 67.

It is not the object here to present the evidence but merely to state the conclusions of this work briefly. The factors found to be involved in the heat coagulation are (placed in their approximate order of importance):

1. The salt composition of the milk, especially the calcium, magnesium, citrate and phosphate contents.
2. The albumin content of the milk.
3. The temperature to which the milk is heated before it is condensed.
4. The acidity of the milk.
5. Homogenizing.
6. Rennet-forming organisms in the milk.



Vacuum pans used for concentrating the milk

The salt composition of the milk is regarded as a very important factor. Calcium and magnesium salts have one effect; citrates and phosphates have an opposite effect; when the two classes are properly balanced the milk is most stable toward heat; an excess of either class makes the milk less stable toward heat. In commercial practice, too rapid coagulation of the concentrated milk usually is due to the calcium and magnesium being in excess in this "salt balance." The remedy is the addition of the proper amount of either disodium phosphate or sodium citrate. The quantities of these salts concerned in such an unbalanced condition and the quantities needed to correct it are small; they can be expressed in terms of several thousandths of a per cent (in the customary terms in milk analysis, viz. CaO, MgO, P_2O_5, and citric acid).

A high albumin content makes the milk coagulate more readily. A high albumin content and a high calcium content are characteristic of milk early and late in the lactation period. During the time when the milk is largely made up from such sources, rapid coagulation is more troublesome. This usually is some time during the fall, winter, or spring months. Periods of difficulty in the manufacture of evaporated milk are common during that time. The exact time of occurrence of these periods depends largely upon the coincidence of the "drying off" and freshening of a large number of cows. A plant may have several of these periods. In localities where the cows are bred so that they freshen in scattered periods throughout the year, less trouble is likely to be experienced, but even in such cases the coagulation is more troublesome during the months when the cows are not on pasture because the citrate content of the milk is lower. When cows go on pasture in spring, the citrate content of the milk increases noticeably and there is a marked change in the behavior of the milk toward heat.

The temperature to which the milk is heated before it goes into the vacuum pan is important. In general, the lower the forewarming temperature, the more readily the milk will coagulate in the sterilizing process. Usually the milk is heated to boiling in open kettles before it is drawn into the pan. Where trouble is experienced with too rapid coagulation, the situation can be improved somewhat by longer heating.

The explanation of the effect of the forewarming temperature is that the higher temperature precipitates more calcium (as tricalcium phosphate) and coagulates more albumin, leaving less in solution to affect the coagulation later in the sterilizing process. Thus this factor is intimately connected with the first two mentioned.

It cannot be denied that the acidity of the milk is important, but it is not as important as even the present use of sodium bicarbonate (added to reduce the acidity) would indicate. The mere fact that such use delays the coagulation is not proof that the fundamental trouble was acidity. Making the milk less acid produces a series of changes in the milk:

1. It changes some of the primary phosphate to secondary phosphate. Primary phosphates are ineffective in the salt balance; secondary phosphates are effective.
2. At the less acid reaction more calcium will be precipitated as tricalcium phosphate when heat is applied.
3. The net result is a decreased soluble calcium content and an increased secondary phosphate content; the milk is made more stable toward heat because indirectly the "salt balance" has been corrected.
4. At a less acid reaction more rapid caramelization occurs during the sterilization process; greater injury to the color and flavor of the milk results.

The conclusion is obvious: where the trouble is really "unbalanced salts," the better remedy is to add the proper salts, even though sodium bicarbonate may bring about the desired improvement. In any event sodium bicarbonate will correct the milder cases of "unbalanced salts" successfully.

With an increase in acidity the converse of the above is true. In rather rare instances milk will coagulate too readily because of "unbalanced salts," *with citrates and phosphates in excess.* In such cases the milk can be improved by adding the proper amount of calcium chloride or calcium acetate; and just as in the case of an excess calcium where reducing the acidity improves the milk, so also in the excess of citrates and phosphates *an increase in acidity* improves the milk. Increasing the acidity changes secondary to primary phosphate, will retain more calcium in solution when the milk is heated,

and hence will tend to re-establish a proper balance in the salts. The rather paradoxical result is that increasing the acidity makes such a milk more stable toward heat. The writer has actually demonstrated this in commercial practice in several instances, and others have been reported to him.

Apart from the above, acidity also has a direct effect: if the acidity is too high the milk will, of course, coagulate more readily.

Homogenizing makes the milk more susceptible to coagulation. The higher the pressure, the more pronounced the effect. The result of homogenizing is not fully understood or explained. Some batches of milk show considerably more effect due to homogenizing than others.

Rennet-forming organisms when grown in milk in sufficient numbers will cause the milk to coagulate more readily. Hence they must be considered as a possible cause, although a rather remote one, since the number of rennet-forming organisms usually present in milk is quite insignificant.

The viscosity of the product is controlled through the coagulation that occurs during the sterilizing process. The control of the coagulation so that it is neither too rapid nor too slow is through an intelligent application of the above explained factors. No one factor alone can be used, but all of them must be considered in proper relative value and remedial measures applied accordingly.

Color and Flavor—The color of evaporated milk is slightly deeper than that of milk or cream, due to a slight caramelization of the milk sugar during the sterilizing process. The extent of this caramelization depends upon temperature, time held at the high temperature, and reaction.

In the sterilizing process both temperature and time affect the caramelization, but of the two factors time is more important. To illustrate this more specifically, in order to produce the desired viscosity in the milk, let us say it was found necessary to heat to 240 deg. F. for 25 or even 30 minutes. The same result could be accomplished at 245 deg. F. for 15 minutes. As far as coagulation is concerned, within the temperature range used for sterilizing it has been found that an increase of 1 deg. F. will decrease the time required to attain equal coagulation by about 2 to 3 minutes. Of the two processes mentioned in the above assumed case, the latter produces the lighter color and better flavored milk. This is the main reason why the industry in recent years has turned to a higher temperature and shorter hold in the sterilizing process, instead of the lower temperature and long holding periods used formerly.

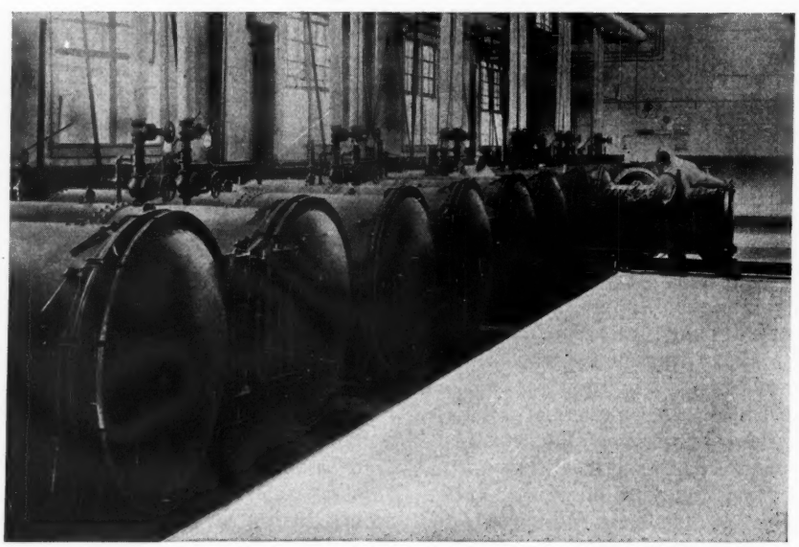
Reaction is another very important factor in controlling the color of evaporated milk. If the milk has a low acidity, if the milk has been neutralized partly, it develops a noticeably darker color on sterilizing. If a light colored milk is to be made, the acidity should be increased rather than decreased.

The flavor of the milk is similarly affected by those factors that cause a darker color. Besides these effects on flavor there is the additional possibility of feed flavors in the milk, and fermentation flavors due to inadequate sanitation and cooling of the milk before it reaches the plant.

The kind of metals the milk comes into contact with and the quantity of metal dissolved by the milk are important. Much is to be learned in this direction, but we already know that under certain conditions milk will dissolve appreciable amounts of copper, and that this has a markedly injurious effect on the color and flavor of the milk.

As evaporated milk ages it develops a characteristic aged flavor and color. We have reason to believe that the rate of this change is dependent upon an oxidation, in which the oxygen in the air in the air space of the can, and iron and copper are involved. Because the desirability of avoiding copper in the finished product is now beginning to be appreciated by the industry, radical changes in the equipment used in evaporated-milk plants may be expected.

"Lime Grains"—As evaporated milk ages a gritty separation of mineral matter often may be found in the can. This consists of calcium citrate and phosphate. In evaporated milk there always is such a concentration of these salts that precipitation must occur. The question of whether the precipitate will be noticed as "lime grains" depends upon the size of the particles formed rather than upon their presence or absence. A high viscosity slows up diffusion and hence the growth of the "lime grains." Thus the main method of controlling this defect is to make the product so that it has a rather high viscosity, and store the product at a low temperature.



A battery of one of the several types of retorts used for sterilizing the canned milk

It is possible that clarification of the milk previous to condensing would have a beneficial effect in removing suspended particles which might serve as foci for crystallization. More can be learned about this rather common difficulty.

The problems outlined here are the main technical problems confronting the evaporated-milk industry. Space has permitted only a brief discussion of these problems, but it is hoped that this discussion will give the general reader an insight, and the reader who is directly interested and concerned, a better perspective and possibly some suggestions.

Food Colors Increase Attractiveness In Harmless Fashion

By HORACE T. HERRICK

Principal Chemist in Charge, Color Certification Laboratory, Food, Drug, and Insecticide Administration, U. S. Department of Agriculture, Washington, D. C.

THE QUESTION of coloring matter in food is as old as food itself. Insects of the Carboniferous Age were attracted to flowers by the brilliancy of their shades; and our arboreal ancestors, as they swung through the tree tops, were guided to the food they sought by the difference in hue between fruit and foliage. Along with many other instincts from an older day, this desire for color has come with us into the complexities of our modern life, and we find ourselves drawn to the garish labels in the grocery store, much as the baby in his cradle, or the child in the candy shop, reaches for the brightest object within his range of vision.

Of course, this impulse has been qualified and softened by more mature experience, and to the adult color has become Nature's warning as well as her guide. We have learned to associate certain shades with certain objects, so that the purple that is pleasant in the plum is questionable in the apple, and those who are accustomed to milder shades in corn and beans will hesitate before a plate of crimson succotash. Nevertheless, color does make food attractive, and we shrink from a bloodless beet almost as quickly as from one of unnatural hue, largely because we feel that something unusual has happened to cause the change.

In less fastidious times, when food was consumed in the state in which it was provided for us by nature, an unusual color, as well as an unwholesome odor or taste, was good reason for hesitation; but with the advance of civilization the kitchen and the cannery have intervened between the plant and the palate, and the processes of cooking have had their way with the natural tissues of the food. When this change first came into being, the producer and the consumer of food were one, and the head of the household, since he could account for every step through which the dish had passed, could blame any lack of appetizing appearance either on unavoidable effects of the preparatory process or on the lack of skill of the preparer. Any change of color could be accounted for and discounted by a knowledge of the cause.

IN THIS day matters have advanced to a point where personal supervision is no longer possible. We do our gardening in the grocery or delicatessen, and in our selection of foods odor and taste have taken an inferior place to sight in an era in which a large proportion of our food is supplied to us in cans and bottles. We can judge only by what we see, and we choose instinctively the product that comes nearest to our ideal.

Food manufacturers have to be practical psychologists as well, and to their understanding of our instincts is due the fact that the use of coloring matters in foods is almost as old as the marketing of foods in any but their natural state. As early as the second decade of the nineteenth century we find complaints of the addition of coloring matters to canned and bottled goods to conceal damage or adulteration. Materials so used ran all the way from harmless soluble compounds, such as turmeric, to ground brick dust, and the use of chromate of lead and sulphide of mercury to simulate nature's shades gave grim significance to the text under which Fredrick Accum attacked the food adulterator of his day: "There's death in the pot." (Life and Chemical Services of Fredrick Accum," by Charles Albert Browne, Chief, Bureau of Chemistry. *J. of Chem. Education of Am. Chem. Soc.* 2, 829, 1925.) It is to the use of such substances as these that we trace the prejudice against artificial coloring, a prejudice that still finds expression in laws against the use of added color in foods, with especial reference to dyes of non-vegetable origin.

In this day of rouge and lip-stick, Ruskin's "Lamp of Truth" burns but dimly, and the present-day housewife can hardly raise sincere objection to the use of colors in food to give an attractive appearance. There is, however, a curious fallacy which holds that because a color is of vegetable origin it is harmless. It is difficult to see where this belief arose, unless it is from the fact that so many of our foods come from a similar source; but it would hardly do to color our soft drinks with the purple of the nightshade berry or the red of the poison sumac, merely because these dyes come from a plant and not from a factory. Moreover, many vegetable colors pass through processes of extraction and concentration which are fairly comparable to the chemical reactions taking place in the manufacture of some of our simpler artificial colors, so that equal opportunity exists for contamination by harmful chemicals picked up in their passage through the factory.

AS A matter of fact, artificial colors, especially the so-called coal-tar colors, are of all varieties, ranging from those which are extremely poisonous to some that are as harmless as common table salt. When these colors were first introduced they were hailed with joy because of their wide range of shade and high tinctorial value, and were used indiscriminately in the coloring of foods. As a result of this carelessness, and because many of the most poisonous aniline dyes were among the earliest products of research in this field, cases of illness or even death were traced to the improper use of coal-tar dyes, and the belief became general that all such colors were dangerous.

With the appreciation that this was far from the truth, attempts were soon made to distinguish between the harmless and the harmful colors, and a large body of

literature grew up around attempts to formulate a list of colors that could be added to foods without injury to the food or the consumer. In 1907, with the passage of the federal Food and Drugs Act, the question of the use of colors in foods was among the problems taken up by the Department of Agriculture. A careful search and consequent compilation of the literature on the subject led to the publication of a bulletin (Department Bulletin 147) dealing with the work which had been done on the poisonous effects of coal-tar dyes prior to that time. As a result, seven permitted coal-tar colors were named as suitable for use in the coloring of foods and drinks, with the stipulation that they were not to be employed to conceal damage or inferiority. In the list were included a red, a scarlet, a pink, an orange, a blue, a green, and a yellow dye.

The placing of colors on a permitted list, however, is only the beginning of the story, for if the public is to be given the impression that certain colors are harmless, steps must be taken to see that the colors so sold are as specified.

There are three ways in which a coal-tar dye may be poisonous: because of the nature of the dye itself, because of the presence as impurities of other dyes which are poisonous, or because of harmful inorganic contamination from the chemicals used in the manufacturing process. The publication of a permitted list takes care of only the first contingency, while continual vigilance is the sole safeguard against the last. At the same time, therefore, that the permitted list was published, machinery was set up under the Food and Drugs Act to assure the public of a supply of pure artificial colors for use in foods. Specifications were drawn, covering the quantities of impurities, both organic and inorganic, which would be permitted in food colors, and the allowable quantities of each are very low.

ANY color which passes the rigid tests established at that time is guaranteed to be of the highest purity. Every manufacturer wishing to submit colors for certification must send in affidavits covering the process of manufacture and the analytical results, along with a true sample of each batch. The figures given in the affidavits are checked in the Color Certification Laboratory of the Food, Drug, and Insecticide Administration, which is charged with the enforcement of the federal Food and Drugs Act. If the results are satisfactory, a lot number is issued and the manufacturer is allowed to market that particular batch as a certified food color.

Food colors are certified under three heads: primary colors, repacks, and mixtures. Primary colors are the dyes as they are produced at the factory and sold by the manufacturer. If primary colors are bought in bulk and then resold by another dealer in his own package, the color must be recertified as a repack. This is necessary because the original dealer cannot accept any responsibility for a color after it has passed beyond his control; therefore, for the purposes of resale, a dye on which the original package seal has been broken must be recertified before it can again be placed on the market as a certified color.

It also frequently happens that a user cannot find among the primary colors the particular shade or concentration of dye he desires, making it necessary to mix two or more of the primary colors or to add some diluent to give the wished-for effect. Such colors are called mixtures and are recertified by the dealer making up the mixture. In the case of repacks and mixtures, both affidavits and analysis are far less complicated than in the case of primary colors, as the dyes concerned have already passed as certified colors.

Naturally, all the regulations and analytical limits as first promulgated did not prove satisfactory and changes in both the regulatory and chemical aspects of the certification of food colors have taken place from time to time. The Food, Drug, and Insecticide Administration has published a circular dealing with the regulations covering certified food colors (Service and Regulatory Announcements, Food and Drug No. 3) and a bulletin covering the specifications and methods of analysis (Department Bulletin 1390). Copies of these may be had on application to the Administration.

IT MIGHT seem, from the wide range of colors on the original permitted list, that it would have met all needs, but this is far from the case. Since the formulation of the original list, eight new colors have been added, for one reason or another, bringing the total up to fifteen. The new colors include four yellows, a red, two greens, and a blue. As dyes vary in their properties, the color that is suited for a soft drink may not go well in candy, while a special variety is required for the coloring of butter.

The following is a list of the dyes now on the permitted list, with the dates on which they were admitted. The numbers preceding the names are references to the Colour Index, which contains a complete description of all well-known dyes. The dyes which do not carry this number have been recently developed especially for food colors, and have not yet been included in the Colour Index:

Red shades:
80—Ponceau 3R, 1907.
184—Amaranth, 1907.
773—Erythrosine, 1907.
Ponceau SX.

Orange shade:
150—Orange I, 1907.

Yellow shades:
10—Naphthol Yellow S, 1907.
640—Tartrazine, 1916.
22—Yellow AB, 1918.
61—Yellow OB, 1918.
Sunset Yellow FCF, 1929.

Green shades:
666—Guinea Green B, 1922.
670—Light Green SF Yellowish, 1907.
Fast Green FCF.

Blue shades:
1180—Indigotine, 1907.
Brilliant Blue FCF, 1929.

The procedure followed by manufacturers in placing a new color on the list forms an interesting chapter in the story of certified food colors. First of all, a definite need for the new color must be shown, for there is no reason for having a long list of colors, some of which are never used. In the second place, it must be clear that this dye or its necessary intermediates are not protected by patents or in any other way, for if the color is admitted to the list, the privilege of manufacture must be free to all. Then the manufacturer must submit a large sample of the new dye, along with an analysis showing the absence of harmful impurities. This analysis is carefully checked in every detail by the chemists of the Food, Drug, and Insecticide Administration. Finally, the manufacturer is expected to submit the results of a series of physiological tests, made by some well-known pharmacologist, showing by actual experimenta-

tion that the dye is harmless for human consumption. Such tests are also confirmed by the Administration. When the proposed dye has finally been accepted for the permitted list, a notice is sent to all manufacturers, two months prior to the first date of certification, stating that this dye will be placed on the list at the time specified, so that there can be no complaint of undue notice to the public and interested manufacturers.

The procedure outlined in the foregoing paragraphs has now been in operation for more than twenty years. During that time the quantities of coal-tar dyes certified have grown to the amazing figures for the year ending July 1, 1929, of 337,802 pounds of primary colors, 28,589 pounds of repacks, and 337,847 pounds of mixtures. These colors are employed in candies, soft drinks, cakes, sausage casings, and a variety of similar products as well as in the home, for cake icings and home-made candies. Bearing in mind always that added color must not be used to conceal damage or inferiority, the Food, Drug, and Insecticide Administration of the Department of Agriculture has endeavored to assure the public of sources of harmless artificial colors, and the word "certified" has become widely recognized as the government's guarantee of purity and safety in coal-tar food dyes.

A Successor to Vanillin

By GEORGE DEFREN
Consulting Chemist, Newton, Mass.

VANILLIN, the active flavoring principle of the vanilla bean, has been known by its present name since 1858. It was first synthesized by Prof. Ferd. Tiemann in 1874-5, closely followed by methods by Haarman and Reimer, and others, and put on the market by the above chemists, who formed a company to develop synthetic flavoring materials. They still manufacture it in large quantities.

The discovery of processes for the synthetic production of vanillin was an important asset to the community. Had it been necessary to rely on the vanilla bean pickers for its requirements, the flavoring industry would be paying fancy prices for its beans today. Research chemists have been busy improving synthetic vanillin and lowering its cost.

When first imported, vanillin sold for $800 per pound. Competition and quantity production forced drastic reductions in price, so that by 1897 vanillin was selling at $1 per ounce, or $14 per pound. Its price has continued to decline gradually, but has been "pegged" at $6.75 per pound for several years in the United States.

While vanillin made a good product we must admit it was not as good as vanilla extract made from vanilla beans. In spite of many improvements in quality, that statement holds good even today. The difference has been shown to be due to a blend of flavoring materials, also present in vanilla beans.

While "aging" helped to improve the flavor of vanilla-bean extracts, and also the products to which it was added, the same cannot be said of materials flavored with vanillin, which seems to lose some of its potency gradually and often develops a rank flavor. As is usual in such cases, science was not content to rest on its accomplishments. Was it possible to improve on vanillin, nature's product?

The laboratory had produced many compounds not found in nature, and many of these were superior to those that nature had brought forth, such as special dyes, medicinals, and the like. The chemical construction of vanillin being known, it was only logical to ascertain what its neighbors would be like; and bourbonal was born chemically in 1895. At least, that is the first reference the writer could find of its existence. It was baptized some time later, the name signifying that it had an odor and a flavor analogous to that of bourbon vanilla beans.

Bourbonal is crystalline, melting at 80 deg. C. It has an intense and very sweet, pure vanilla odor. It is a definite chemical compound and is not a mixed vanillin. The writer found five patents for this article issued in 1895. One of these patents called attention to the fact that the substance possessed an intense vanilla flavor, but no comparisons were made, possibly because the material of those days had not been sufficiently developed. At any rate, the merits of this new substance, as we now know them, remained obscure for many years, and it was only recently that the purified article became something other than a chemical curiosity.

Now vanillin and bourbonal are closely related chemically. Vanillin, melting at 80-81 deg. C., is the methyl ether of protocatechuic aldehyde, or 4 hydroxy, 3 methoxy, benzaldehyde ($C_6H_3.CHO.OH.OCH_3.$), the name depending on its source or derivation, while bourbonal, the ethyl ether of this same protocatechuic aldehyde ($C_6H_3.CHO.OH.OC_2H_5$), has a difference of only a CH_2 grouping in the substituting side chain. But that little CH_2 grouping makes a vast difference in the two products, for the new compound is a flavoring material four times as strong as vanillin; that is, one unit of bourbonal affects the nerves of taste four times as much as does an equal weight of vanillin. Or, using the reciprocal form, it requires only one-quarter as much bourbonal to give as strong a flavor, or odor, as does vanillin.

Commercially, dividing the quoted price of bourbonal by four immediately gives almost the merit value of vanillin. The word "almost" is used advisedly. While the flavoring effect of vanillin is generally assumed to remain constant, it really loses a little value in time, when incorporated in, for example, a chocolate coating and put in storage, but bourbonal increases and mellows its flavor and aroma under the same conditions. In other words, bourbonal, as an aromatic and flavoring

Ethyl protocatechuic aldehyde was discovered in Germany, where it has been called by the trade name Bourbonal for more than 15 years. Since its recent introduction into the United States it has been called by a variety of names some of which are Bourbonal, Vanaldol, and Vanalone—The Editors.

material, produces results in finished goods comparable with those from vanilla beans. The new compound is free from the "empyreumatic" or "close" odor frequently noticed in vanillins, and the absence of the chemical "kick" which is often mistaken for strength.

It is necessary to digress for a moment. Ethyl protocatechuic aldehyde (bourbonal, or other trade name) is not, and by no stretch of technical nomenclature can it be called, "ethyl vanillin," unless it be for colloquial—although incorrect—convenience. True, ethyl vanillin, chemically considered, is theoretically possible. It has, in fact, been made, but reports indicate that it has not even as much flavor as has ordinary vanillin.

Bourbonal, like vanillin, is soluble in alcohol, 1 to 5, and to a lesser extent in water, 1 to 250 in cold, or 1 to 100 in warm water. Glycerin and ethylene glycol dissolve both of these flavoring materials. Bourbonal can be used in every case where vanillin has been used, and with better results. Curiously, this new compound can be too good. Our benign Prohibition law, at least as formulated by the Prohibition Bureau, does not consider its merits. An imitation alcoholic vanilla extract calls for 0.69 gram of vanillin or coumarin, either or both, in 100 cc. Since bourbonal is four times as strong as vanillin, 0.1725 gram will replace 0.69 gram of vanillin, and give the extract a truer vanilla flavor. However, the Bureau claims that a reduction in the crystalline content of the extract would not render the extract unfit for beverage purposes, despite the fact that vanilla extracts complying with the board's formula are already potable. The Bureau, therefore, insists that, if ethyl protocatechuic aldehyde is used in place of vanillin, it must be used in the same strength or proportion as the latter. This makes the new material unavailable, since its selling price is about 2½ times that of vanillin. The net result is that the public is deprived of a considerably more effective quality of imitation vanilla extract than it has now available.

About two years ago bourbonal sold in the United States at $24 per pound. In August, 1929, it was selling at from $14 to $17 per pound, depending on the quantity purchased. The fact must not be overlooked that bourbonal is carrying a tariff burden of $7.50 a pound, and the consumer can still pay the price and get more and better value than he can get from vanillin on the 1 to 4 basis. Were this material tax free it would be selling at about $7 to $8 per pound, which is only a little higher than vanillin today, which is selling at about $6 to $7 per pound.

As the merits of this new synthetic product becomes more generally known and appreciated a larger output should indicate prospectively lower prices. In fact it is freely predicted by those in position to know that it is only a question of time when bourbonal, and its companion products, will sell at about the present price of vanillin, and vanillin will retire from the stage.

Federal Food Control Protects Consumer in Many Ways

Originally Concerned With Dangerous Adulteration, Food Law Officials Now Seek to Abate Fraudulent Practices

By P. B. DUNBAR[1]

Assistant Chief, Food, Drug, and Insecticide Administration, Department of Agriculture

ONE of the most striking developments in the food situation during the past 20 years has been the gradual transfer of food manufacture from the domestic kitchen to the factory. The federal Food and Drugs Act of June 30, 1906, has perhaps been more influential in bringing about this change than any other single factor.

Today the public has a confidence in manufactured foods which was out of the question in the years preceding the enactment of this measure. Consumers know that food products moving in interstate commerce are subject to a governmental supervision which practically assures their freedom from adulteration and misbranding. Ethical manufacturers are aware that they are protected against unfair competition with unfit articles and may devote their energies to putting out pure and wholesome products honestly prepared and honestly sold.

Twenty-five years ago elements of the food industry opposed the passage of the Food and Drugs Act. Today efforts to weaken the measure through amendatory legislation have been more earnestly combated by food industries than by almost any other agency. In fact, important organizations of food manufacturers are at this moment seeking extensions of the law which will impose even more rigid control upon their operations. This is because farsighted members of the industry appreciate that an effective enforcement of the law is advantageous not only to the consumer but in an equal degree subserves trade interests through preventing unfair and destructive competition.

[1]Originally published Sept. 27, 1929, by the *U. S. Daily* as "Topical Survey of the Government," Topic 1, Article 7.

The Food and Drugs Act, formerly enforced by the Bureau of Chemistry, is now administered by the Food, Drug, and Insecticide Administration of the Department of Agriculture. This Administration came into existence on July 1, 1927, when it took over the law enforcing personnel and machinery of the Bureau of Chemistry.

For enforcement purposes the country is divided into the Eastern, the Central, and the Western Food and Drug Inspection districts. The Eastern District includes the Atlantic Coast States and Porto Rico; the Central District covers the Mississippi and Ohio Valleys; the Western District embraces the Rocky Mountain and Pacific Coast States. Each district is in charge of a chief, who is responsible directly to the Administration at Washington.

The inspection districts are subdivided into areas known as station territories, in each of which is a food and drug inspection station, presided over by a chief and supplied with a staff of chemists, inspectors and clerical assistants. Each station is responsible for the supervision of all of the food and drug industries in its territories and reports directly to the chief of the inspection district.

There are at present 18 such stations scattered throughout the United States at convenient points. Those near the coasts have been established in seaport cities in order that the requirements of the Food and Drugs Act as they apply to imported products may be readily enforced. In addition to the field laboratories, staff laboratories are maintained at the headquarters of the Administration in Washington for the purpose of developing methods of analysis, collecting data, and coordinating the work of the field stations.

The present personnel of the Administration is approximately 500 persons, about 35 per cent of whom are stationed in Washington. Somewhat more than one-half of the total personnel are technically trained, principally as chemists, with the necessary complement of bacteriologists, microscopists, medical officers, pharmacologists and veterinarians. The chiefs of inspection districts are responsible for uniformity of action throughout their territories, such action being developed in accordance with definite operative plans worked out where possible in advance by the administrative officers in the field and at the central offices in Washington.

IT IS the duty of the field force to collect representative samples from shipments subject to the act, to make necessary analyses and to procure satisfactory evidence of the law's violation. All proposed legal actions, however, are subject to review and decision by the administrative officers in Washington and also by the legal officers of the department, as well as by the Secretary of Agriculture and his immediate assistants.

Since all actions brought under the law are instituted in the federal courts, there is a further review of the evidence of violation by the prosecuting attorney to whom cases are referred by the Secretary of Agriculture. Two forms of penalty are provided for infractions of the law: (1) Criminal prosecution against the individual or firm responsible for bringing the product within the jurisdiction of the law, and (2) seizure of the offending goods under a libel issued by the federal courts and their confiscation, destruction, or disposal under conditions that will not be violative of state and federal laws.

It has been the established practice of enforcing officials to make seizures only:

1. In the case of food products containing added poisonous or other added deleterious ingredients which may be harmful to health;
2. In the case of food products consisting in whole or in part of filthy, decomposed, or putrid animal or vegetable substance, or any portion of an animal unfit for food, or a product of a diseased animal or one that has died otherwise than by slaughter;
3. In the case of food or drug products so grossly adulterated or misbranded with false or fraudulent claims that their distribution constitutes a serious imposition on the public;
4. In the case of deliberate frauds in the shipment of adulterated or misbranded food products that seriously demoralize legitimate trade practices.

There is no authority in the Food and Drugs Act permitting officials of the Food, Drug, and Insecticide Administration on their own initiative to impose penalties or to seize or destroy products without due process of law. Whenever violations are discovered and action, by either criminal prosecution or seizure, is instituted, the responsible party is entitled to appear in the federal courts and is subject to no penalty unless or until he or the goods has been convicted of a violation of the law. Upon conviction or proof of violation, the penalty to be imposed is wholly within the discretion of the court subject to statutory limitations.

THE impression prevails perhaps that the Food and Drugs Act is designed almost exclusively to prevent the use of poisonous or deleterious ingredients in food. The act, however, is much broader in scope. Protection of the public against the use of poisonous or harmful ingredients in foods is an important purpose, but deleterious food products are rarely encountered. By far the greater part of the energy of the enforcing agency is expended in preventing those forms of adulteration and misbranding which involve a fraud upon the consumer rather than an actual menace to health.

Approximately $1,000,000 is expended yearly in enforcing the Food and Drugs Act, an annual expenditure of something less than 1 cent per capita for the insurance of the purity and wholesomeness of the nation's food and drug supply. Unquestionably, the saving to the consumer through insuring his receipt of an honest dollar's worth, and the protection of legitimate business against unfair competition is an economic gain far in excess of the cost of enforcement.

The act applies only to products shipped in interstate or foreign commerce or manufactured, sold, or offered for sale in the District of Columbia and the territories. The federal government has no jurisdiction over products manufactured or sold within the limits of a state, but fortunately, most states have laws designed to control the purity of the food supply distributed within their borders, paralleling closely the federal law, and there is close and constant co-operation between state and federal authorities.

In the course of 22 years of enforcement more than 16,000 cases under the law have been presented to the courts. The object of the Food, Drug, and Insecticide Administration in its enforcement of the law, however, is not to establish a record of fines collected or offenders prosecuted, but to assist and encourage the food and drug industries to comply intelligently with all reasonable exactions, so that the consumer may have a maximum of protection and the necessity for punitive measures may be reduced to a minimum.

ABSTRACTS · OF · CURRENT · LITERATURE

VANILLIN. Lucien Mauge. *L'Industrie Chimique 16,* 302-5, 362-6, June and July, 1929. Vanillin occurs in the ligneous tissue of many plants, and even in some lignites. It is also found in certain resins, especially Siamese benzoin. As long as the only large commercial source was the vanilla bean, the price was very high and efforts were made to utilize other natural sources, chiefly Siamese benzoin and oat hulls. Synthetic production gradually brought the price down; for example in France from 8,000 francs per kilo in 1876 to 45 francs in 1913. Among the raw materials from which artificial vanillin can be made are coniferin (a glucoside from conifers), eugenol (from clove oil), protocatechuic aldehyde and guaiacol. Synthetic methods starting with cresol and with mesoxalic ester have chemical rather than practical significance; the same is true of numerous other chemical methods which are known. In recent years some work has been done in France on the commercial exploitation of extraction from lignite as a source of vanillin. Methods and equipment used in the industrial preparation of vanillin from clove oil are described and illustrated. The eugenol is first treated with caustic to convert it to isoeugenol, which is acetylated and oxidized to acetylvanillin. This, by alkaline hydrolysis, yields vanillin. In some plants the oxidation is effected with bichromate. Ozone also is used, without acetylating the isoeugenol; in this process resinification of the aldehyde is prevented by oxidizing in the presence of bisulphite. Uses of vanillin, as a flavor and as a perfume, are briefly discussed.

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PIQUI-A FRUIT OIL. C. D. V. Georgi. *Malayan Agricultural Journal 17,* 166-70, June, 1929. Piqui-a fruit was introduced into Malaya from Brazil about nine years ago for estate cultivation. Like oil palm fruit, it has two oils, one in the pericarp and one in the kernel. Both can be used for edible purposes. The pericarp oil has chemical constants closely resembling those of palm oil. The ripe fruits cannot be stored, however; they contain an enzyme which causes liberation of free fatty acids in the oil, and so must be treated without delay. The pericarp oil is reddish orange, and easily congealed by cooling; the kernel oil is yellow and is semi-solid at room temperature. The kernels are used as a dessert nut in South America and the West Indies. Properties of the oils are tabulated.

* * *

NEW BAKE OVEN. F. T. Munch. *Industrial Gas 8,* No. 2, 15, August, 1929. A new multiple-deck oven utilizes the sectional plan of construction, like a sectional bookcase. It may be installed as a one-deck oven, and additional decks may be added as needed. Each deck has its own gas burners and thermostatic control, so that different products can be baked at the same time even though they require different temperatures. For a small bake, it is unnecessary to heat the whole oven; only the decks actually used are lit. When more than one deck is in use, efficient utilization of the heat is provided by a system of baffles whereby the second deck receives heat from the first, and the third from the second. A table of gas consumption data is given.

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DRY MATTER IN VINEGAR. Guido Dona. *Giornale di chimica industriale 11,* 264-5, June, 1929. Determination of the dry content of vinegar has been a tedious process on account of the necessity of repeated evaporation, after diluting with distilled water, to make sure all the acetic acid was liberated as free acid and volatilized. A much shorter method has now been developed, using an accurate hydrometer with movable scale, calibrated in vinegars of known dry content. The sample is evaporated to one-third its volume and restored with distilled water to its original volume. It is titrated, and a solution of pure acetic acid in distilled water is made up to the same acid concentration. The scale of the hydrometer is adjusted so that its zero coincides with the meniscus in the pure acid solution. The hydrometer reading in the sample, divided by the constant for the instrument, then indicates the dry content of the sample.

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PILCHARD OIL. H. N. Brocklesby. *Canadian Chemistry and Metallurgy 13,* 212-4, August, 1929. Pilchard oil is a product of the sardine fisheries of the west coast of Vancouver Island. It is obtained by heating the fresh fish in continuous cookers and pressing while hot. The oil is light brown, quite free from fish odor, and will deposit up to 50 per cent of its weight in stearin on standing, according to the temperature. This precipitate of solid or semi-solid glycerides can be hydrogenated to a firm, almost pure white mass. The clear oil separated from the precipitate can be bleached and partially sulphonated. It can also be bodied by heat or by blowing with air or ozone. With driers, it can be made to dry about as quickly as boiled linseed oil; and its films are about as resistant to moisture as those from linseed oil.

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DRIED EGG PRODUCTS IN ICE CREAM. Wm. S. Mueller and Forrest C. Button. *Journal of Dairy Science 12,* 320-32, July, 1929. Trials have been made of the effect of dried egg yolk, albumin and whole egg on the freezing time, keeping qualities, texture and flavor of ice cream. Dried egg yolk increased the whipping properties, thus shortening the freezing time per batch, and also improved the texture of the product. It did not have a stabilizing effect. Dried whole egg had similar effects on whipping properties and texture, but slightly less pronounced than with the dried yolk. It was slightly injurious to flavor, whereas the dried yolk was not. Dried egg albumin was injurious to texture and flavor and had no stabilizing effect. In all the trials the concentration of egg product added to the mix was 1 per cent. The effect of dried yolk and dried whole egg on texture was more noticeable in low-solids than in high-solids ice cream. The same is true of the flavor effect. All the egg products increased the apparent viscosity, with only a slight increase in the basic viscosity of the mix. No relation was observed between the apparent and basic viscosities and the ability to obtain overrun.

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BLEACHING FLOUR. A. Lejeune, *L'Ingenieur Chimiste,* 13, pp. 30-3, March-April, 1929. The origin of flour bleaching is traced back to the discovery by Zeise, in 1846, that the pigment in flour (carotin) is decolorized by chlorine. At least 25 years ago flour was being bleached "electrically" in Europe, the true agent being nitrogen peroxide. The other leading bleaching agents are chlorine, alkali metal persulphates and benzoyl peroxide. The Rothenfusser test is applicable to the solid agents—namely, the persulphates and benzoyl peroxide. The reagent for this test is p-diamino-diphenylamine sulphate. Novadelox is a mixture of benzoyl peroxide with acid calcium phosphate (1:6), used in a concentration of 0.13 per cent for bleaching flour. Under the name of Lucidol, benzoyl peroxide is used also for bleaching fats and oils. Chemical bleaching of flour is prohibited in some countries, including Belgium. Trial tests have shown that benzoyl peroxide can be detected in flour more than a month after bleaching.

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RESPIRATORS. Oscar Neuss. *Chemische Umschau auf dem Gebiete der Fette, Oele, Wachse und Harze,* 36, pp. 190-3, June 19, 1929. Increasing use of solvent extraction processes in the oil and fat industry has multiplied the respiratory hazards for workmen. This has brought a corresponding development in the use of respirators and gas masks for protection—e. g., against dusts in seed grinding establishments and against solvent vapors in extraction plants. Several types, from simple dust respirators to elaborate chemical gas masks, are described and illustrated,

with emphasis on the Degea mask for protection against carbon disulphate, the chlorinated ethylenes and other toxic solvents.

* * *

TRANSIT REFRIGERATION. E. F. McPike. *Refrigerating Engineering 18,* 1-4, July, 1929. Shipment of perishable foods requires three protective services: Ventilation, refrigeration and artificial heat. The last is limited to winter transit, mainly in the Northwest. A serious economic problem in transit of refrigerated food products is the large proportion of empty travel in the total mileage of refrigerator cars. Use of a returning refrigerator car for revenue freight is limited because it cannot carry merchandise which would be damaged by dampness, or which would leave an undesirable odor, or which might wet or contaminate the interior of the car. It is also barred against carrying rough or heavy freight. Standard ventilation, furnished by the railroads from Oct. 15 to April 15, calls for closing of hatches, doors and windows at 32 deg. F. or lower and opening them at a higher outside temperature. For pineapples, sweet potatoes and tomatoes the deciding temperature is 40 instead of 32 deg. F. Practical considerations to be observed in handling, icing and re-icing cars are discussed. Lists of perishables are given, under the headings: Deciduous fruits, citrus fruits, tropical fruits, berries, vegetables and melons. In addition numerous commodities are listed which need refrigeration, and some which need protection from cold only. The latter include canned goods, catsup, chestnuts, liquid drugs, jams and jellies, pickles and preserves, and vinegar. Six types of refrigerator cars are cited: Bunker, brine tank, beer or ice, fruit-vegetable insulated, fruit-vegetable ventilated, and fruit-vegetable ventilated box—all but the last being insulated against heat loss.

* * *

FREEZING GRAPES. M. A. Joslyn. *Fruit Products Journal 8,* No. 11, 10-1, July, 1929. Grapes cannot be stored at the temperature (32-35 deg. F.) usually used for fresh fruits. It has been found, however, that they can be preserved indefinitely, as juice, or crushed, or whole fruit, by a process of sharp freezing. In preserving juice, partial clarification is first effected by chilling below 40 deg. F. and allowing to stand one or two days. The juice is then frozen solid and stored at 15-20 deg. F. When thawed, this juice cannot be distinguished from fresh juice. It is more economical to freeze and store the juice in cakes, hard enough to be handled with tongs like ordinary ice, than to freeze it in barrels or kegs. In either case it must be protected from absorption of foreign odors. Crushed grapes also can be preserved by sharp freezing; but there is no apparent advantage in this except where it is desired to ferment juice and skins together, as in the manufacture of grape vinegar. Preservation of whole grapes, unstemmed, is possible by rapid freezing in a dilute sirup, preferably in a small enough container to avoid crushing of the bottom grapes. The freezing should be done at a temperature below 0 deg. F. so that fine ice crystals will be formed; the larger crystals of slower freezing puncture the cell walls and make the product limp when thawed. Storage of the frozen grapes may be at 15-20 deg. F.

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FRUIT CEREAL. H. M. Reed. *Fruit Products Journal 8,* No. 11, 13 and 15, July, 1929. The need of the prune industry for new markets, to prevent any hold-over from one year's crop to the next, led to a study of the possibilities in specialty products. One of the early attempts along this line was to combine the energy value of cereals with the healthful properties of prunes in a breakfast food. The principal difficulty was to incorporate sufficient of the fruit without making the product undesirably tough. A successful method has been devised, however, which is quite simple and requires very little equipment. A recipe is given for the dough, which is to be baked, dried, crushed and toasted. The toasting must be done very carefully to avoid burning. The product is attractive in taste and appearance, is nutritious and has a natural laxative effect. It is considered to be particularly valuable for children, since they do not always take readily to laxative foods. Other fruit pulps can be used instead of prune pulp, but the laxative effect of the prune cereal is one of its best marketing aids. The chemical composition of fruit cereal is such that it forms a quite complete food when eaten with milk and sugar.

* * *

CONDITIONING WHEAT. T. H. Fairbrother. *Industrial Chemist 5,* 281-5, July, 1929. In conditioning wheat for most complete separation of bran and endosperm and for most economical milling, it is necessary to know the distribution of moisture in the berry, as well as the total moisture content. It must also be remembered that the conditioning process initiates certain chemical and biological changes, notably proteolysis and amylolysis. In some wheats, proteolysis will be detrimental to the baking qualities of the flour; others need some proteolysis. Conditioning should be done with full knowledge of the physical and chemical nature of the wheat to be treated, and with accurate control of the temperature and humidity. Research is needed, particularly on the chemical effects of conditioning and on the changes in flour strength which result from a given treatment.

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THE COLOR OF WHEAT FLOUR. A. C. Hardy, P. I. Cole and C. W. Ricker. *Industrial and Engineering Chemistry,* Analytical Edition, vol. 1, July 15, 1929, p. 151. A recording color analyzer has been used to study the color of samples of wheat flour of different grades, both bleached and unbleached. Illustrations show the results obtained in several tests. More work along this line will be necessary to develop a commercial model of the color analyzer for routine purposes.

* * *

INVERT SUGAR IN CAKE MIXTURES. C. A. Glabau, *Bakers' Weekly,* vol. 63, July 6, p. 69; July 13, p. 70; July 20, 1929, p. 63. Invert sugar as well as other substances are being quite generally used for the purpose of producing cake which will be sufficiently moist to lend itself to storage and transportation. Photographs and tabulated data show that for pound cake between 5 and 10 per cent of invert sugar produces the best product. It is very important that the proper quantity be used and the batch put together in the right way. Formulas used for sponge cake are given and methods of introducing the invert sugar into the mixture are discussed.

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BUTTERMILK AND ITS USES. C. A. Glabau. *Bakers' Weekly,* vol. 63, July 13, 1929, p. 77. Various types of buttermilk that are available to the baker are discussed. The use of buttermilk in baked goods produces very desirable results for the operator who fully understands its properties and its action on the gluten of wheat flour.

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GRADES OF SUGAR USED IN CHOCOLATE AND OTHER DARK CAKES. C. A. Glabau. *Bakers' Weekly,* vol. 61, June 29, 1929, p. 42. The suitability of various grades of dark sugar for cakes is discussed. Selection of a particular sugar should include the qualities of color, caramel taste, hygroscopic properties and possible infection with mold spores. Photographs illustrate the effects of different sugars in cakes. Formulas are given as well as a discussion of caramel icing.

* * *

STUDIES IN CEREAL CHEMISTRY—IV: THE RÔLE OF MOISTURE IN WHEAT AND FLOUR. T. H. Fairbrother. *The Industrial Chemist,* vol. 5, June, 1929, p. 243. The milling of wheat and keeping qualities of flour are influenced greatly by their moisture content, which also affects the heating of wheat and the weight per bushel. The author also discusses the relation between moisture content and insect infestation of wheat and flour.

* * *

HYPERVITAMINOSIS AND VITAMIN BALANCE. L. J. Harris and Thomas Moore. *Biochemical Journal,* vol. 22, p. 1461. Young rats lost weight rapidly and died when fed synthetic diets containing 0.1 per cent of irradiated ergosterol (about 100,000 times the minimum protective dose). Whether these results were due to the toxic substances found along with the vitamines or the ability of the rat to discriminate in its choice of food is discussed. There is no reason to fear using preparations, such as irradiated ergosterol, which manufacturers place

at our disposal, for the quantities required to produce toxic effects are at levels outside those in the practice used commercially or employed in clinical practice.

* * *

ELECTROPHORESIS. F. Chemnitius. *Chemiker-Zeitung,* May 8, 361-2; May 15, 378-80. The physical chemistry of electrophoretic processes is elucidated and its mathematical laws are formulated. Cells suitable for electro-osmotic and electrophoretic processes are described and illustrated, and practical considerations are stated. One of the most widely applicable arrangements is a cell with two diaphragms (of material chosen according to the intended use), each forming a partition for one electrode. One of the leading applications is in the purification of water, electrolytes being first removed by electro-osmosis and the colloidal impurities being then separated by electrophoretic deposition. The purification can even be made selective to some extent; thus, water for breweries can be largely freed from Mg, leaving desirable salts in the treated water. Another important application is in accelerating the impregnation of hides with tanning agents. Others include removal of proteins from beet juices or sirups in sugar refining; electro-osmotic control of electrochemical oxidations; dewatering sludges or pastes which cannot be filtered, and refining kaolin and other natural clays. Electrophoretic cells can be used singly or in batteries of several, according to the purpose. A battery used in water purification is illustrated.

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DIESEL ENGINES FOR FLOUR MILLS. Orville Adams. *American Miller,* vol. 57, July 1, 1929, p. 712. The miller should compare his present power cost with the estimated cost of application of Diesel power. Proper installations of engines to meet load conditions is important. One installation of a 360-hp. Diesel engine cut power cost from 12c. (steam) to 3c. per barrel. Unfounded objections often prevent a profitable change to Diesel power.

* * *

MOISTURE IN WHEAT. T. H. Fairbrother. *Industrial Chemist, 5,* pp. 243-5, June, 1929. The quantity of moisture in wheat must be controlled within fixed limits for satisfactory milling; if too dry, it is flinty on the mill and gives impure flour, and if too wet it is sticky on the mill and gives a lower yield of flour. There always is a loss in moisture during milling. Since the moisture content of flour is an important factor in its keeping qualities, proper control is necessary both before and after milling. Flour to be used fresh may be quite wet (up to 17 per cent moisture sometimes in English mills), but if the flour is to be stored it must, of course, be dry enough to retard the growth of fungi and bacteria and to prevent infestation by mites. With respect to milling behavior, the distribution of moisture in the wheat berry must be considered, as well as the actual quantity. For storage and transportation, wheat should not contain over 15 per cent moisture. The critical figure, with respect to heating and spoilage in storage, is about 14 per cent in soft wheat and 15 per cent in hard wheat.

* * *

WATCH FOR MEAL WORMS THESE HOT DAYS. R. T. Cotton. *Bakers' Weekly,* vol. 63, July 6, 1929, p. 60. The distribution and origin of meal worms is discussed in detail. Periodic thorough cleaning of mills, warehouses and granaries should prevent them from becoming established. Infested material may be treated by heating for an hour or longer at 130 deg. F., or with fumigants such as carbon disulphide and ethylene dichloride—carbon tetrachloride mixture.

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BEET SUGAR. M. Garino and A. Rege. *Giornale de chimica industriale 11,* 61-3, 64-7; M. Frigerio, *ibid.* 67-9, Feb., 1929. The coloring matter in beet molasses is of two kinds: products of caramelization, and acids (glucic or apoglucic) derived from the action of lime on invert sugar. The two types behave differently toward ultra-violet light, but the distinction is difficult in beet molasses, which contains other luminescent substances. Trials with active carbon show promise as a means of decolorizing, but more research is needed with a view to increasing the effective surface or the activity of the carbon. Beet tops, even when they have been treated with copper-containing insecticides, can be used as stock feed if properly prepared and stored in silos, where the oxalate content is destroyed. Only about a third of the small amount of copper retained by the leaves is soluble in gastric juice of animals fed with the ensilage.

* * *

INVERSION OF SUCROSE IN BEET-HOUSE SIRUPS. R. J. Brown and H. W. Dahlberg. *Industrial and Engineering Chemistry, 21, 282,* March, 1929. A satisfactory method for the determination of invert sugar in beet-factory sirups is given. The effect of various factors on the rate of loss of sucrose in beet sirups was roughly determined. A decrease in pH from 8 to 6 increased the rate of loss about ten times. A temperature increase of 10 deg. C. increased the loss 2 to 3 times. Variation in concentration of solutions produced no marked effect on the rate of loss of sucrose.

* * *

A WHEAT-POWDER EXTRACT TO TAKE WORK OUT OF BAKING. B. W. Dedrick. *American Miller, 57,* 343; April 1, 1929. The author has prepared from wheat an extract, which is used in the preparation of quick bread. Less than an hour elapses from the start of mixing until the bread is taken from the oven. The amount of extract used is 1½ per cent and it can be manufactured very inexpensively. The extract increases weight and volume, and contributes a delicious flavor according to certain reports. Photographs of bread made with the extract are given.

* * *

OXIDASE IN FRUITS. W. V. Cruess and W. Y. Fong. *Fruit Products Journal, 8,* No. 10, p. 21, June, 1929. The browning of freshly cut surfaces of apricots, peaches, pears and apples (due to accelerated oxidation of the natural color bases under the influence of the fruit peroxidase) is greatly retarded by the sulphur dioxide which is used for bleaching the anthocyan pigments of such fruits. Experiments have shown that a little sulphur dioxide (about 60 mg. per liter) will inactivate the organic peroxide which is involved in the oxidation, but that a much higher concentration (about 1,600 mg. per liter) is required to inactivate the peroxidase itself. The tests also showed that the effect is temporary; when the sulphur dioxide is leached out, the organic peroxide and the peroxidase are again able to function. That is, the effect is inactivation, not destruction.

* * *

FERMENTATION. F. F. Nord and J. Weichherz. *Zeitschrift fur Elektrochemie 35,* 612-8; September, 1929. Cell fermentation has been studied from the standpoint of the kinetics of a reaction in a closed space. The influence of the cell membrane, the sugar concentration and the stirring treatment has been tried experimentally. It was found that mechanical stirring accelerates sugar fermentation, and that the acceleration is a result of a membrane action. The Slator theory, that the rate of reaction is approximately independent of the sugar concentration (in the range 0.5 to 10 per cent), was found to be incorrect. Cellular fermentation is typically a reaction occurring in a space separated from another space by a semi-permeable membrane; and it follows a complex exponential equation which shows that it is not a simple monomolecular reaction.

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VITAMIN B. Hans von Euler and Karl Myrbäck. *Svensk Kemisk Tidskrift 41,* 209-11; August, 1929. The chief advances in the utilization of fat-soluble vitamins have been the production of vitamin D by irradiation, and the proof that vitamin A has a poly-ene structure and is closely related to carotin. These contributions have not been matched in the water-soluble vitamins. It has been found, however, that there are two separate vitamins in what has been called vitamin B. One is anti-neuritic; the other is growth-promoting. A close relationship has been observed between the B vitamins and von Euler's co-zymase; but it has now been definitely established that the similarity does not amount to identity. Newly obtained evidence also indicates, almost with certainty, that co-zymase is a nucleotid, and that its activity depends largely on its content of organically combined phosphorus.

· CRITICAL · BOOK · REVIEWS ·

INDEX TO THE LITERATURE OF FOOD INVESTIGATION. No. 1, March, 1929. Compiled by Agnes Elisabeth Glennie. Department of Scientific and Industrial Research. Published in London under the authority of His Majesty's Stationery Office. Can be obtained in the U. S. at the British Library of Information, 5 East 45th Street, New York. 85 pages. Price 55 cents.

NOT only is this publication a bibliography of the more fundamental titles pertaining to food investigation but it is also a classified bibliography together with a critical review of the early history of food preservation, beginning with certain observations by Francis Bacon in 1626. The review is particularly interesting on account of its development of the fact that in cold storage and refrigeration the engineer has far preceded the biologist, when, as a matter of fact, the order should have been exactly the reverse—the biologist should have furnished specifications for the engineer to follow. It is merely a restatement of the old principle, of which we have heard so much in the last few years, to the effect that science has not caught up to the art.

The sections covered include Meat, "Pig-Flesh," Poultry and Game, Dairy Produce, Fats and Oils, Fruits and Vegetables, Grains, Crops and Seeds, Theory of Canning, Theory of Freezing and Chilling, Bacteriology, Mycology, Engineering and Miscellaneous. Each citation of the literature is in the form of an abstract describing the method of treatment of the subject, rather than an abstract of the subject matter.

While turning over the pages of this bibliography one can see that the literature of the world has been well covered. The author has not played national favorites, and for this she deserves commendation. It is regrettable, however, to observe that a few of the unreliable papers of the literature of food investigation should have been included in this publication and thus their memory be perpetuated instead of forgotten, but inasmuch as they are a part and parcel of the technical literature of the subject one feels that the editor who failed to prevent their original publication, rather than the indexer of the world's literature, deserves the blame.

Literature from a wide variety of sources that is not commonly found in the indexes of the abstract journals—transactions of royal societies, proceedings of engineering societies, trade papers not commonly abstracted, such as *Better Fruit*, and newspaper supplements, such as the *London Times* Engineering Supplement, are included, as well as the well-known technical and scientific periodicals, government and agricultural experiment station bulletins.

L. V. BURTON.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Food Specifications. Mimeographed U. S. Government Master Specifications as follows: No. 317a, oatmeal and rolled oats; 161b, coffee; 624a, canned asparagus; 265a, canned string beans; 626a, canned beets; 627a, canned corn; 628a, canned peas; 629a, canned pumpkin; 630a, canned sauerkraut; 631a, canned spinach; 632a, canned tomatoes; 636a, pearl barley; 637a, biscuit; 638a, cornmeal (white or yellow); 639a, cornstarch; 640a, soda crackers; 641a, wheat flour; 642a, buckwheat flour; 643a, graham flour (whole wheat meal); 644a, tapioca; 645a, hominy grits and coarse hominy grits; 646a, canned lye hominy; 647a, rice; 648a, spaghetti, macaroni, and vermicelli; 649b, tea; 650b, cocoa; 651b, chocolate; 619a, beef; and 621a, canned apple sauce. Also Navy Department specification 61M5, electrically operated dough mixing machines.

Dairy Investigations, by T. W. Moselev and others. U. S. Department of Agriculture Technical Bulletin 116. Fifteen cents. Describes dairy work at the Huntlev Field Station, Huntley, Mont., 1918-1927.

Pasteurization of Milk, by S. Henry Ayers. U. S. Department of Agriculture Bulletin 342. Five cents. Indicates the present status of pasteurization of milk.

Alkaline Washing Solutions, by Robert Page Myers. Reprint from *Journal of Agricultural Research,* Vol. 38, No. 10; May 15, 1929. Deals with the germicidal properties of alkaline washing solutions, with special reference to the influence of hydroxyl-ion concentration, buffer index, and osmotic pressure.

Trade Rules of Cheese Assemblers' Industry. Mimeographed report issued by the Federal Trade Commission on the Trade Practice Conference recently held by the industry.

Beef-Cattle Production in the Range Area, by Virgil V. Parr. U. S. Department of Agriculture Farmers' Bulletin 1392. Ten cents.

Statistics on Beverages, Flavoring Extracts and Flavoring Sirups, Malt. Separate pamphlet of the Census Bureau for the 1927 Census of Manufacturers, containing the customary biennial statistical statement. Five cents.

Sulphur-Spray Residues and the Swelling of Tin Cans Packed With Peaches, by C. W. Culpepper and H. H. Moon. Reprint from *Journal Agricultural Research,* Vol. 39, No. 1; July 1, 1929.

Trade Practice Conferences. Federal Trade Commission Document. Thirty-five cents. Includes agreements reached with reference to trade matters in a number of conferences, including among others food industries such as: Butter manufacture, cheese assembling, cottonseed oil, edible oils, package macaroni, and spice grinding.

Manufacture of Neufchatel and Cream Cheese in the Factory, by K. J. Matheson and F. R. Cammack. U. S. Department of Agriculture Bulletin 669. Ten cents. Undertakes to describe proper factory practice and means for eliminating rule-of-thumb and secret processes.

Marketing of Pecans, by J. W. Park and H. E. Rutland. Preliminary mimeographed report of the Bureau of Agricultural Economics. An economic study including factors of production and transportation as well as marketing considerations.

Fisheries of Pacific Coast States, 1927. Bureau of Fisheries Statistical Bulletin 839. Final official summary of production data.

Trend of Candy Sales for Six Months. Mimeographed statement from Foodstuffs Division, Bureau of Foreign and Domestic Commerce, giving statistics for six-month period January to June, 1928, and for the fiscal year ending June 30, 1928 and 1929.

Ruling on Chewing Gum Flavoring. Informal press statement of the U. S. Department of Agriculture dated Sept. 20, announcing the department ruling, which is in brief that "Label must not imply that true fruit juices or flavors were used if in fact that flavoring was artificial."

Flour Markets of Central America, by Felix T. Pope. Bureau of Foreign and Domestic Commerce Trade Information Bulletin 635. Ten cents.

Vitamins in Beef and Pork, by Ralph Hoagland. Reprint from *Journal of Agricultural Research,* Vol. 38, No. 8; April 15, 1929. Treats of these meats as a source of antineuritic and water-soluble B vitamins.

Cold Storage of Eggs and Poultry, by Thomas W. Heitz. U. S. Department of Agriculture Circular 73. Fifteen cents. A résumé of growth and future prospects of the industry, containing technical discussion of methods and desirable precautions.

· SELECTED · PATENTS ·

Rapid Automatic Fruit Preservation—Berthold Gernhardt of Berlin, Germany. No. 1,726,482. Aug. 27, 1929—Stewing fruits in water in a closed vessel, then treating them with a solution of 66 per cent of sugar dissolved in cold water and under a pressure of carbon dioxide at a pressure of 10 atmospheres.

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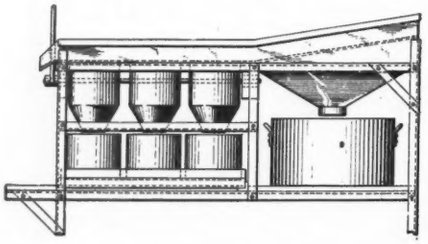
Another Use for Alcohol—Fred Ransohoff, of New York, to the Fleischmann Company. No. 1,722,858. July 30, 1929—A method of growing yeast using ethyl alcohol as a source of energy for growth.

* * *

Yeast Manufacture—Erwin Klein, of Voslau, near Vienna, Austria, to the Fleischmann Company. No. 1,722,803. July 30, 1929—Process of manufacturing baker's yeast by two stages, the first of which is the production of "forced" yeast by aeration in a nutrient solution of materials that are difficultly assimilable and in the second stage feeding the yeast with materials which are easily assimilable.

* * *

Oyster Draining and Canning Machine—George H. Frederick, of Baltimore. No. 1,716,771. June 11, 1929—A convenient table for draining oysters and subsequently measuring them for packing into shipping containers. Oysters are dumped on the drain board over the



large hopper, then after draining are pushed over the small hoppers, which act as measuring devices. By movement of a lever the measured quantity is dropped into receptacles below.

* * *

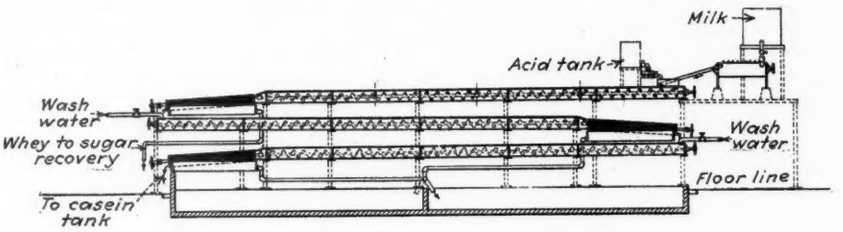
Apparatus for Producing Non-Sticky Raisins—Thomas W. W. Forrest, Oakland, Calif., to Sun-Maid Raisin Growers of California. No. 1,711,729. May 7, 1929—Description of equipment to produce raisins that will not stick together.

* * *

Vacuum Evaporator—Gustave A. Zeitler, of Oakland, Calif. No. 1,721,760. July 23, 1929—The vacuum evaporator which is described on page 422 of June Food Industries. Characterized by having a heating tube assembly which is removable, for cleaning or other purposes.

* * *

Milk Strainer—Harvey E. Duke, Portland, Ore. No. 1,703,440. Feb. 26, 1929—A strainer of cloth between two disks of perforated metal, which form the bases of a pair of cones. The strainer may be inserted in any vertical milk line having upward flow.



Casein Manufacturing Process—William H. Sheffield, of Hobart, N. Y. No. 1,716,799. June 11, 1929—A continuous process for the manufacture of acid-precipitated casein to give a product of as high quality as the self-soured or natural casein. The product is held to a low ash content by the method of washing and breaking up the curd.

* * *

Synthetic Fruit Product — Bronson Barlow, of Madison, Wis. No. 1,717,489. June 18, 1929—A process of combining the expressed juice of one fruit with the fruit of another type which has been dried. Suggested combinations are the juice of the lemon or lime with prunes and raisins, to be carried out by spraying or dipping the dried or partly dried fruit with the juice with which it is to be impregnated, and drying. The operation is carried on until the desired result is obtained.

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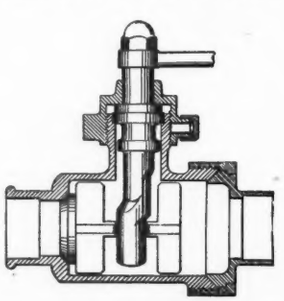
Sweet Potato Crisps—C. C. Baker, of Dallas, Texas. No. 1,718,211. June 25, 1929—A process patent giving complete details of manufacture of sweet potato crisps.

* * *

Cheese-Treating Machine — Charles Doering and Henry H. Doering, of Chicago. No. 1,716,488. June 11, 1929—A machine for treating cut and wrapped cheese, consisting of submerging the packages wrapped in cheesecloth or tinfoil while under compression in either hot water or brine, which has the purpose of sealing the wrapper or tinfoil and also sealing the pores of the cheese. With the brine at boiling temperature the heat treatment does not exceed one minute.

* * *

Milk Valve — Lars C. Thomsen, Kenosha, Wis., to Tri-Clover Machine Co., Kenosha, Wis. No. 1,711,432. April



30, 1929—An easily cleaned and demountable milk valve which may be locked either open or shut.

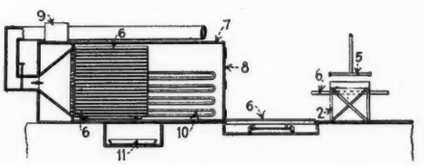
Improving Near Beer—Herman Heuser, of Chicago, to United States Process Corporation. No. 1,720,329. July 9, 1929—A method of improving dealcoholized near beer by the addition of an extract of licorice.

* * *

Purifying Raw Sugar Juices—Herman Schreiber, of Lansing, Mich. No. 1,724,376. Aug. 13, 1929—A method of utilizing the proteolytic enzymes of the cane to break down albumins and proteins to substances of low molecular weight that do not inhibit crystallization, carried out by heating raw sugar juice having a purity of about 81 per cent to a temperature between 50 and 60° C. for a period of 35 to 50 minutes before liming. The heat treatment increases the coefficient of purity by about 1 per cent.

* * *

Controlling the Sulphur-Dioxide Content of Dried Fruit—F. J. Prowse et al. to California Packing Corporation, of San Francisco. No. 1,724,514. Aug. 13, 1929—Previously sulphured dried fruit is washed in the apparatus shown in the drawing. The fruit is then maintained at an elevated temperature to



further soften it; then placed in chamber 7, during which time sulphur dioxide is circulated in the atmosphere surrounding the fruit. By this means sulphur dioxide is either added or removed until the fruit has reached its proper SO_2 content.

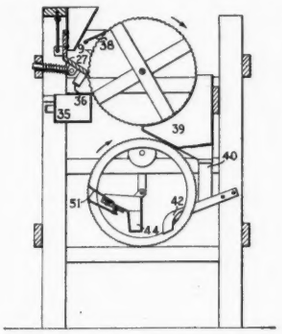
* * *

A New Use for Pectin—M. B. Patteson, of Corona, Calif., to California Fruit Growers' Association. No. 1,726,364. Aug. 27, 1929—Covering the use of pectin as an emulsifying agent for the mineral oil sprays employed in controlling pests in orchards.

* * *

Purification of Oils—Henry Odeen, Palo Alto, Calif. No. 1,705,825. March 19, 1929—No. 1,705,825 differs from 1,705,824 only in the time of adding the water for accelerating the reactions of the process. In this patent the water is added to the oil after the "dry chemical" instead of before, as in No. 1,705,824.

Grain Cleaner—Joseph Volz, of Elliott, N. D. No. 1,717,748. June 18, 1929—Two rotating cylinders are mounted as shown in the drawing, the upper one having coarse pockets and the lower one having fine pockets. Wheat to be cleaned is poured into hopper 9 and is carried upward together with other seeds by the rotation of the drum. Seeds larger than



wheat are brushed off by the scraper 38 and accumulate on the lower baffle board, from which they can be removed from time to time. Wheat and smaller seeds are carried around the periphery of the drum and deposited in hopper 39 and ultimately find their way into the inside of the lower drum, where the seeds smaller than wheat are removed.

Scraper 51 removes the wheat but smaller seeds travel upward past the scrapers and fall into receptacle 44, from which they are automatically discharged outside. The wheat remaining in the bottom of the cylinder is substantially cleaned and is dumped from time to time by a tilting device.

* * *

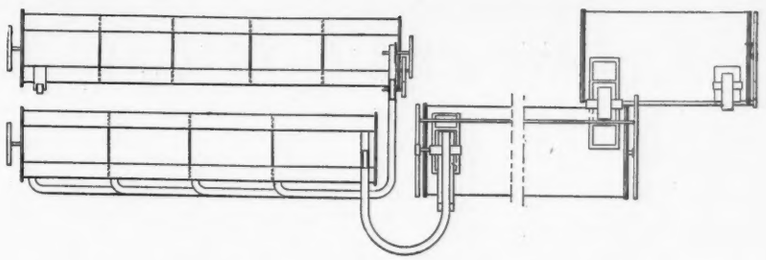
Non-Spoiling Almond Milk Product—Hermann Hofer-Massard, of Lausanne, Switzerland. No. 1,721,522. July 23, 1929—Grated almonds are mixed with whole milk and pressed. To this filtrate sugar is added followed by evaporation to half of its volume. This also has the effect of sterilizing the liquid and destroying enzymes. When closed in hermetically sealed containers it will keep for an indefinite time and upon opening is said to retain its freshness several weeks.

* * *

Powdered Milk—Ninni Maria Kronberg, of Rydsgard, Sweden. No. 1, 721,-867. July 23, 1929—Skim milk is sterilized in a temperature of 115 to 120 deg. C., then cooled to 40 deg. C. and inoculated with lactobacilli such as Bacillus guntheri and Bacillus casei. It is allowed to stand for twelve hours, and then to it is added milk, sugar and sucrose, also coconut fat plus a substance which is rich in diastase. When the acidity has reached 1 per cent the product is desiccated and pulverized. It is reported to have great value in the baking industry.

* * *

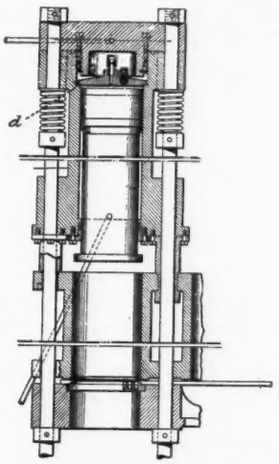
New Method of Canning Milk—A. R. Thompson, of San Jose, Calif., to Anderson-Barngrover Mfg. Co., of San Jose. No. 1,721,751. July 23, 1929—Process patent covering the pretreatment of milk for canning, consisting of passing the cans through a succession of preheating regions, raising the temperature from 110 deg. F. gradually to 200 deg., then holding the cans of milk at 210 deg. F.



for a length of time depending upon the quality of the milk. The next step is to pass the cans through the usual continuous pressure cooker for sterilizing, where the temperature is 240 deg. F., followed by cooling to a suitable temperature for discharging into the atmosphere. The sketch shows the equipment in which the work may be carried out.

* * *

Macaroni Press—Joseph de Francisci, of Brooklyn, N. Y., to Consolidated Macaroni Machine Corporation, of New York. No. 1,703,514. Feb. 26, 1929—An improvement on the hydraulic cylinder



of macaroni presses whereby oil leakage is precluded in the type of press where the cylinder is carried on springs. This is accomplished by having a separate head, D, operating in a small upper cylinder, shown in cut, which can be so packed that oils cannot escape.

* * *

Improving Appearance of Citrus Fruit—H. B. Slater, of Riverside, Calif., to W. B. Clancy, W. A. Johnson and George A. Sarau, of Riverside, Calif. No. 1,719,567. July 2, 1929—The older methods of preparing citrus fruit for the market usually involve dulling the appearance of the fruit. In this process the fruit is washed and sterilized externally in the usual way, followed by treatment with a mineral oil containing a small amount of paraffin, to give it a gloss.

* * *

Lye Peeling Fruit—O. J. Steinwand, of Selma, Calif., to the Rubyette Company, of San Francisco. No. 1,721,929. July 23, 1929—Pretreatment of fruits, such as grapes, plums, prunes and fruits that are not successfully peeled by other known methods, consisting of softening the skin by dipping into a solution of carbonate of soda and sulphite of soda at temperature of 170 to 212 deg. F., which will soften the skin and permit it to be peeled in the usual lye-peeling equipment.

* * *

Can Feeding Machine — Joseph A. May, of Hayward, Calif., to Hunt Bros. Packing Co., of San Francisco. No. 1,-716,968. June 11, 1929—A machine for feeding cans consisting of two conveyors at right angles. One of them brings up cans set on promiscuously, and upon reaching a device at the end, the cans are arranged in a single file and are carried away on a high-speed conveyor to siruping machines or other equipment. A feature of the device is that it will handle cans of any size.

* * *

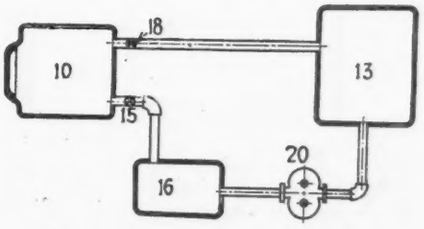
Removing "Rag" in Grapefruit Canning—A. W. Stott, of Clearwater, Fla., to Hills Brothers Company, Inc., of New York. No. 1,719,631. July 2, 1929—Describes a method of removing "rag" from grapefruit which has been peeled, by first subjecting the peeled fruit to a non-pressure spray of caustic solution followed by rinsing with a non-pressure spray of cold water. The fruit then passes through a clarifying tank and out on a conveyor, where it is dried by a blast of air.

* * *

By Products From Beet Sugar Molasses—K. Ikeda of Tokyo, Japan. No. 1,721,820. July 23, 1929—A method of separation of valuable substances such as potassium sulphate, glutamic acid, betaine from the waste water of beet sugar molasses after the removal of sugar.

* * *

Sterilizing by Alternate Pressure and Vacuum—Herbert J. Kratzer, St. Louis, Mo. No. 1,711,097. April 30, 1929—Liquids to be sterilized are placed in chamber 10. Valve 18 is closed and 15 is opened. Pump 20 is started, discharging into chamber 13. After a pres-



sure of about 75 lb. absolute is built up, valve 18 is opened and the liquid subjected to the vacuum that has formed in chamber 16. The process is repeated if necessary. The effect of the sudden reduction of pressure is supposed to kill the bacteria.

· WHAT'S · ON · YOUR · MIND? ·

An open forum for the exchange of opinion

Depreciation—Its Use And Misuse

To the Editor of FOOD INDUSTRIES:

The June issue of FOOD INDUSTRIES contains an article, "Depreciation Should Reflect All Costs," by Ernest F. DeBrul, which is so misleading that I am very sorry it got by your staff and was printed.

Many executives (as my own did) will refer this article to their accountant and be set aright, but hundreds will read it as authority and in attempting to put its theories into operation will mess up their records and very likely be called to task by the Federal Income Tax officials.

I am inclosing a short article on "depreciation," which will clarify the situation for those who took Mr. DeBrul's article seriously. Use it if you like.

"Poor old man 'Depreciation' is always being knocked around, kicked and trampled upon, and all because he insists on minding his own business. We try to shoulder a thousand and one other duties upon him, but he stubbornly refuses to accept them. No wonder he has become slippery, treacherous and elusive; his self-preservation depends upon it. We wouldn't expect our office boy to draft plans for a new plant. He might try it, but it is beyond his sphere of responsibility. And yet we expect depreciation to assume duties which are just as logical, and when we force the issue the result is the same as that of the office boy with his draft of a new plant.

"The economist and the accountant apply the principles of depreciation to modern business, perhaps from different angles, but if they stay within the direct realm of application they will both arrive at the same theoretical result. But it is only in remote cases where the economist or accountant misuses the application of depreciation. More often it is the modern business executive who tries to make depreciation do all kinds of ridiculous things. The old adage, 'A little knowledge is a dangerous thing,' applies most forcibly in this case. Now and then a business man, after spending a few hours reading technical works on depreciation, will try to tell the men who have spent years of study and experience that they are all wrong. Happily the majority of executives depend upon their accountant for the correct interpretation and application of accounting terms and practices.

"Depreciation in itself, shorn of all technicalities and exotic responsibilities, is very simple. A man exchanges cash for a machine, he exchanges more cash for materials, he exchanges still more cash for labor; he utilizes these three elements to produce merchandise which he sells for more than it cost him to make and sell, and thereby makes a profit. At the end of a certain period the machine is worn out, the materials are all used up, and the labor has been expended. What has the man left? The cash which he exchanged for the machine, materials and labor plus his profit. Now if he wants to continue in business he must purchase another machine, more materials, and more labor. He may have to pay more for any or all of the elements, but if he wishes to continue in business it is his only way.

"While he is making his profit he pays for labor as he uses it; he purchases a supply of materials and as he uses them he charges them to costs; as he uses the machine he charges a share of its purchase price to his costs, under the name of depreciation. This continues until all material and the machine are used up.

"Now suppose this man said, 'When this machine is used up, it will cost me twice as much to purchase another one like it, so to be prepared for that time I will write off twice as much depreciation to my costs.' Would his cost records be true? Would they not show that he was using up two machines instead of one? Could he not say the same thing of materials and labor, and likewise write into costs twice what he actually paid for them? We all admit that this practice would not only be absurd but would result in his financial statements being untrue.

"This man knows what he wants to accomplish but doesn't know how to proceed in order to bring about the desired result, so he shoulders the responsibility onto much abused 'depreciation.' Now let us see what this man might do to accomplish the results he desires, and still keep his cost records correct. Suppose he periodically writes off the correct labor used, the correct materials used, and the correct share of the purchase price of the machine, in the form of depreciation. We acknowledge that his cost records will be correct in so far as the items used are concerned. Good!

"Now suppose that periodically with his depreciation charges he charges to *profit* (not to costs) an amount equal to the amount of depreciation written off, and credits this to a 'Reserve for Replacement of Equipment' account. What is the result? His cost records are correct, his profit is correctly shown and at the time the machine is used up he has the original purchase price plus an equal amount which periodically has been reserved from his profit for this occasion. For his information at all times the financial statements would show how much of the old machine had been used up, how much was still unused, and how much additional had accumulated toward the purchase of a new one.

"Depreciation does not take care of replacement. It does return the original investment. If replacement is to be provided for, it should be taken care of through current profits or earned surplus, and the amount so provided should be based on expected cost of replacement.

"It is now the common practice among business organizations to provide for the replacement of fixed assets. This usually is accomplished by periodically setting aside, 'in reserve,' a certain amount of earned surplus. Financially the only effect this has on the business is to 'ear mark' a portion of the earned surplus so that it may not be used in declaring dividends. Even this procedure does not guarantee the actual money available to replace the worn-out asset. It only theoretically sets aside a portion of the total assets of the business. If the cash balance is sufficient to cover this portion, all well and good; if not other assets must be liquidated for cash.

"Some firms go a step farther and as the depreciation and replacement reserve accounts are created, a similar amount of cash is set aside in a separate account. Whether this is a good policy or not depends upon the particular business and its financial condition. No matter what policy or practice you favor, don't try to overwork your depreciation accounts. They are on your records for a specific purpose, they have a mission to fulfill, and if you force them to do more than their specific duty, they will cause you no end of annoyance and trouble."

CHARLES SCARBOROUGH,
Chief Accountant, Lucidol Corporation,
Buffalo, N. Y.

To Erect Fumigation Plant In Los Angeles

A vacuum fumigation plant is being erected on Mormon Island, in Los Angeles harbor, by the California Cotton Mills. Although there are several such plants on the Pacific Coast this will be the first in southern California. Imports requiring fumigation at the present time are shipped to San Francisco before being released by the Department of Agriculture, even when their destination is in southern California.

Although intended primarily for cotton and textiles, the plant will be equipped to fumigate any foodstuffs which may be imported. The equipment will be of the type described in the May issue of FOOD INDUSTRIES and will use hydrocyanic acid for cotton and textiles, and a CS_2-CO_2 mixture for foodstuffs.

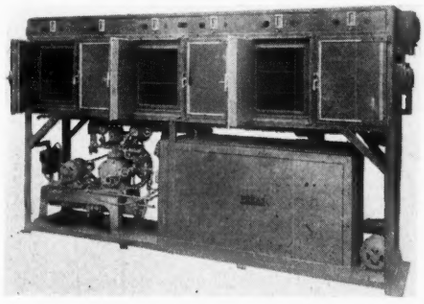
MANUFACTURERS' · NEWS · AND · EQUIPMENT

An All-Temperature Incubator

TO MEET special requirements the Freas Thermo-Electric Company designed an incubator having six compartments, each with a temperature range from 0 deg. to 50 deg. C., with the temperature maintained constant within half a degree at any set value. Each compartment is individually controlled—permitting them to be operated collectively or selectively at the same or different temperatures.

The compartments are 18 in. high x 14 in. wide x 14 in. deep, surrounded by a water jacket in which an electric heater and brine cooling coil are placed. The temperature is controlled by a Freas differential linear-expansion type thermo-regulator.

Mechanical refrigerating equipment is mounted on the under frame—for chilling a brine tank, from which brine is pumped into the various water jackets by a motor-driven centrifugal pump, when the equipment is used at the lower temperatures.

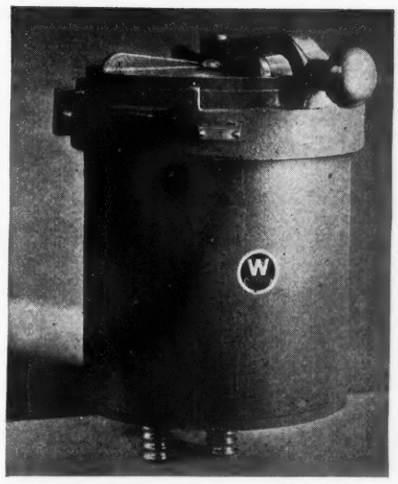


Freas all-temperature incubator

This incubator is useful for research work where accurate tests must be performed at temperatures below 50 deg. C.

New Explosion Tested Type Controller for Small Motor

ADDING to their line of explosion-tested type motors and controllers the Westinghouse Electric and Manufacturing Company announces a new controller of the drum type which provides across-the-line starting for a small D.C. motor. The controller is provided with fuses mounted inside of the controller case and interlocked with a screw type cover to meet the requirements of the U. S. Bureau of Mines for explosion-tested equipment. Accessibility is provided for by mounting the entire controller on the bottom base which is threaded to screw into a cylindrical case. Removing this case uncovers the entire controller for inspection or maintenance.



Explosion-proof electric controller

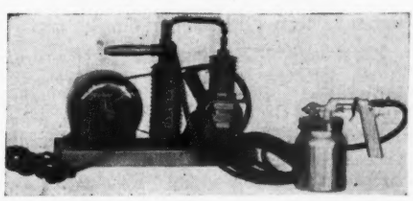
The controller is designed as a small compact unit for application on permissible types of conveyors, pit car loaders, room hoists, small pumps and similar types of apparatus where explosion-tested equipment is required.

Bink's New Hurley Spray Unit

AN ALL-purpose utility spray painting and finishing outfit, known as the Binks New Hurley Unit, has been developed. It is being manufactured for general utility work such as touching up, refinishing, repainting, and lacquering practically any product. Also it is adopted for the spraying of insecticides and disinfectants.

The complete unit is equipped with a quart capacity all-metal container and a new Binks pressure cup spray gun supplying an atomized flat spray four inches in width. The air compressor unit is belt driven by a ¼ hp. General Electric motor and has a capacity of 2.16 cubic feet of air per minute. Ten feet of rubber covered electric cord, attachment plug, and ten feet of durable braided rubber air hose are attached to the outfit. The spray unit is made by the Binks Manufacturing Company, 3114 Carroll Ave., Chicago.

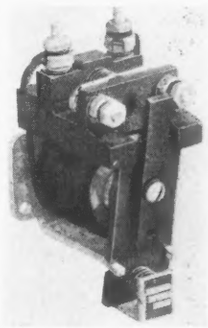
Mechanical spray unit for paints, disinfectants and insecticides



New Relay Actuates Warning Signal in Alarm Circuits

THE General Electric Company has developed a new relay, CR-2810-1245, for use on various types of alarm circuits. This device is of the normally-closed type, and functions to actuate a warning signal on the failure of power. The new relay is strongly built, of simple construction and operates very quietly. The contact construction is of the silver-to-silver type, and is double-break. It is made in standard ratings.

Applications of the relay are expected to be many and various, ranging from simple failure of power where no more serious consequences result, to more involved circumstances where power failure would result in serious consequences such as the failure of heat in an incubator. The warning signal controlled by the relay may be a bell, a horn, a whistle, a light or any other common device, and would probably be energized by batteries.



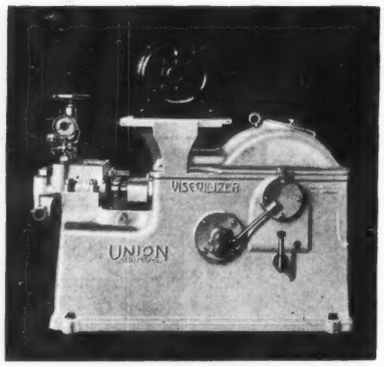
A relay that warns of power shutoffs

Improved Viscolizer

Manufacturers of daily products, and likewise those who are now using older models of the Viscolizer in making salad dressing and other fatty emulsions of similar character will be interested in the improvements on the machine which is manufactured and distributed by the Cherry-Burrell Corporation and its associated distributors.

Suction and discharge valves are designed on the step-valve principle which makes the suction valves larger and heavier than before. They are also interchangeable with the discharge valves, a feature that is particularly important in handling heavy liquids. The new Viscolizing Valve has a bottom intake and a side discharge and it is now possible to remove and exchange the valve and seat without exchanging the entire valve. Drip cocks have been added to furnish a supply of water on the plungers to dissolve any foreign substance which might be carried out on the plungers.

A force feed oiling system is now included (in addition to the running-in-oil, splash lubrication), which forces oil through the stationery cam shaft into the cams and provides positive lubrica-



Improved model of the Cherry-Burrell viscolizer

tion to the bearings subjected to the heaviest load. A crank-case ventilator has also been added to remove the vapor and condensation. The new cylinder block assembly is a solid block of bronze, from which all cylinders, valve ports, and manifolds are machined, eliminating the possibility of sand-hole leaks.

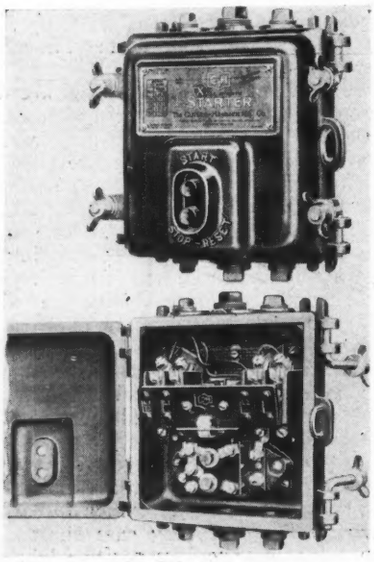
Dust Tight Enclosures for Motor Starters

THE development of dust-tight enclosing cases for their across-the-line automatic starters, has been announced by Cutler-Hammer, Inc., 106 12th St., Wilwaukee, Wis.

These new enclosures are built in two types. For motors up to 5 hp., the case is of cast-iron, and for larger sizes it is made of heavy welded boiler plate. They are provided with a soft Para rubber gasket between the cover and case. Eye bolts with wing nuts at the sides, hold the cover tight. In addition to being dust-tight, the small cast-iron enclosure is also weatherproof. It has the start, stop and reset buttons mounted directly in the cover. The larger sizes have the reset button only in the cover and a separate dust-tight pushbutton station provides remote control.

The new dust-tight equipment does not replace Cutler-Hammer's standard dust-proof enclosures, but is to be offered as an option for installation in mines, woodworking plants, flour mills, pulverizing plants and other industries where the large amount of dust in the air may interfere with the efficient operation of the starter.

Dust-tight motor starter by Cutler-Hammer



Manufacturers' Latest Publications

Unless stated otherwise in the text, free copies of these publications may be obtained from the manufacturer by readers of FOOD INDUSTRIES *who mention our journal in connection with their request.*

"Mechanical Dispersion and the Colloid Mill." Reprint of article by P. M. Travis, of the Travis Colloid Research Company, 119 Broad St., New York City.

Burning Brands. Edwin L. Wiegand Company, 422 First Ave., Pittsburgh, Pa.—Bulletin B-110, describing Chromalox-equipped burning brands for marking wood and semi-wood products.

Motors. General Electric Company, Schenectady, N. Y. — Bulletin GEA-98-A, describing adjustable varying speed motors with 2½ to 1 speed adjustment, either reversible or non-reversible.

Canning Machinery. Berlin Chapman Company, Berlin, Wis.—Catalog No. 27, showing the complete line of equipment manufactured for canning plants, including several types of sterilizing apparatus.

Nickel Jacketed Kettles — Catalog describing nickelware and kettles produced by Lee Metal Products Company, Inc., Phillipsburg, Pa.

Electrical Refrigeration. General Refrigeration Company, Beloit, Wis. — Catalog entitled the A.B.C. of Electrical Refrigeration, and description of several small to moderate sized units.

Electrically Operated Valves. Bristol Co., Waterbury, Conn.—Catalog describing motor-operated and magnet-operated controller valves and recording instruments.

Diesel Engines. Chicago Pneumatic Tool Company, New York City—Bulletin 775 describing M.W.M. Benz Diesel engines, type RH-75, together with fuel charts and specifications.

Refrigeration. Vilter Mfg. Company, Milwaukee, Wis.—Bulletin No. 29R describing twin-cylinder, vertical, inclosed ammonia compressors, giving detailed description of all parts, dimensions and specifications.

Friction Clutches. The Carlyle Johnson Machine Company, Manchester, Conn.—Loose-leaf clutch catalog showing sizes, types and dimensions, of Johnson friction clutches.

Rotary Blowers. P. H. & F. M. Roots Company, Connersville, Ind. — Bulletin No. 22-B1, describing low-pressure type rotary pressure blowers for any capacity at pressures of 2½ lb., or less, together with sizes and dimensions.

Electrical Equipment. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. — Leaflet 20408, describing non-reversing magnetic starter for wound rotor induction motors. Leaflet 1101-B, describing direct-current mill motors.

Acid-Proof Pump. U. S. Stoneware Company, Akron, Ohio—Bulletin D, describing centrifugal acid pumps lined with chemical stoneware and giving specifications and dimensions as well as the usual curves of performance characteristics.

Electrical Equipment. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.—Special publication 1836, entitled "The New Deion Circuit Breaker," which consists of a series of papers and articles from the technical literature of electricity covering the theory and development of the Deion circuit breaker. 50 pages.

Motors. Wagner Electric Corporation, St. Louis—Bulletin 151, describing Wagner air-jacketed motors totally inclosed and self-cooled without pipe ventilators.

Steam Generation. Combustion Engineering Corporation, New York City —Reprint from *Paper Trade Journal*, Feb. 21, 1929, entitled "Paper Mill Steam Plants Keep Up With the Times." An article which describes the possibilities of reducing steam costs.

Colloid Mills. Chemicolloid Laboratories, Inc., 90 West St., New York—Catalog describing Charlotte colloid mills, the processes to which they are adapted and their classifications.

Turbines. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. — Leaflet 2041, describing type Ad mechanical drive turbines of from 5 to 50 brake horsepower.

Celite. Johns-Manville Corporation, New York City—Twenty-four page illustrated circular, entitled "Celite for Concrete," describing the use of Celite in concrete to obtain a greater degree of workability, water tightness and finish.

Automatic Packaging. Pneumatic Scale Corporation, Ltd., Norfolk Downs, Mass.—Bulletin No. 3, describing milling and weighing of flour in sacks, bags and canisters.

Sifters. The Orville Simpson Company, Cincinnati, Ohio — Rotex sifters are described in Bulletin 80, with 56 pages of illustrations, capacities, dimensions, power requirements and screening data.

Centrifuges. Sharples Specialty Company, Philadelphia, Pa.—Catalog entitled "Super Centrifugal Force," a collection of bulletins bound in one cover suitable for filing in a letter drawer or file, describing Sharples super-centrifuges and the processes in which they are applicable.

NEWS *of the* MONTH

Water Ices and Sherbets Improved by Research

With the proper quantity and kind of sugar, and the right degree of "overrun," as the increase in volume due to the whipping of air into the mix is known to the ice cream manufacturer, water ices and sherbets can be made as hard as ice cream without loss of quality, according to studies made under the direction of A. C. Dahlberg at the New York State Agricultural Experiment Station at Geneva.

Failure of ices and sherbets to stand up as well as ice cream under the same conditions, and excessive crystallization of exposed surfaces in plant or retailer's cabinet have long been troublesome difficulties. The present research, described in a bulletin recently published by the station, shows that an overrun of 20 to 30 per cent results in a product that will stand up as well as ice cream, and that a mixture of 25 pounds of cane or beet sugar with 7 pounds of corn sugar to each 100 pounds of mix prevents the tendency of the exposed surface to harden unduly during storage. Apparently, drainage of the unfrozen sirup from water ices and sherbets during storage may be prevented by the addition of 0.2 per cent of agar, combined with milk solids, or gelatin.

Policy of Government Told To Meat Industry

"Self-regulation is the best form of regulation. But let us not forget that it must in truth be regulation," said Secretary of Agriculture Arthur M. Hyde in a message to the conference of the meat industry which assembled on Oct. 22 at his invitation in Chicago to formulate and adopt improved trade policies for the voluntary self-regulation of the meat-packing and wholesale meat business. "The meat industry already is well known for its efficiency and economy of operation. Improved trade practices in this business must come largely through very keen business acumen. Yet I am confident that your efforts will be fruitful because of your willingness to use, for the benefit of the industry as a whole, the same ability that has created and developed your individual enterprises," his message said.

Dr. John R. Mohler, chief of the Bureau of Animal Industry, delivered the Secretary's message. He explained to the representatives of the industry the powers the department has in the regulation of meat packing through the provisions of the Packers and Stockyards Act which, among other features, transfers to the Secretary of Agriculture most of the control of the meat business previously exercised by the Federal Trade Commission. He referred to the many conferences held by representatives of various industries and branches of the federal government, particularly the Department of Commerce, to encourage the adoption and use of ethical practices and economies in the conduct of business.

Alaska Salmon Pack Figures Show Industry to Be Stable

A tentative estimate of the Alaska salmon pack for the 1929 season to Aug. 31, made by the U. S. Bureau of Fisheries, gives a total of 5,200,800 cases to that date, as compared with 5,582,700 cases in 1928 to Aug. 31, and 6,083,903 cases for the entire 1928 season. The average annual pack for the five-year period from 1924 to 1928 was 5,212,753 cases. Thus it is seen that the 1929 Alaskan pack, although somewhat under last year's, will be greater than the preceding five-year average.

An accurate determination of the migration routes of salmon in Alaska has produced a basis upon which the $50,000,000 industry can be stabilized, according to a report of Henry O'Malley, Commissioner of Fisheries, made public on Oct. 14. Routes taken by the migrating salmon have been charted by a system of tagging the fish. It is thus possible, he said, to see that the provisions of the White Law, which limits the annual catch to 50 per cent of the run, allowing the other 50 per cent to escape and breed, are carried out.

COMING EVENTS

NOVEMBER

11–15—American Bottlers of Carbonated Beverages, Atlantic City.
16–22—Pacific Slope Dairy Show, Oakland, Calif.
19–20—National Creamery Buttermakers' Association, St. Paul, Minn.
20-22—Association of Ice Cream Manufacturers of Pennsylvania and New Jersey, Atlantic City.

DECEMBER

3–5—Southern Association of Ice Cream Manufacturers, Biloxi, Miss.
4–6—Wisconsin Cheesemakers' Association, Milwaukee.
5–6—North Carolina Bottlers' Association, Tarboro.
9–10—Missouri Association of Ice Cream Manufacturers, Columbia, Mo.
9–10—South Carolina Bottlers' Association, Columbia, S. C.
10–11—Ohio Canners' Association, Columbus.
12–13—Georgia Bottlers' Association, Atlanta.
12-13—Kansas Association of Ice Cream Manufacturers, Manhattan.
16–17—Florida Bottlers' Association, Jacksonville.
30–31—Society of American Bacteriologists, Ames, Iowa.

Urge Additional Funds for Agricultural Research

A delegation representing 33 national farm, industrial, and commercial organizations called at the White House on Oct. 16 and urged President Hoover that an additional $5,000,000 be included in the next Department of Agriculture budget for an expansion of research. It is desired, according to Chester H. Gray, Washington representative of the American Farm Bureau Federation, who acted as spokesman, to get the activities of the Department of Agriculture away from an emergency basis and provide for an aggressive, forward-looking program based upon the actual needs of the agricultural industries.

The condition and quality of agricultural products depend upon the best possible control of the factors of production, distribution and utilization, it was pointed out. "Research is itself farm relief," said Mr. Gray.

Dried Pineapple Process Developed in Porto Rico

Pineapples may be dried, concentrated so that one pound of the dried product is equal to fifteen pounds of fresh, and yield a product that, upon being soaked in water, regains almost its original appearance and taste, if a process developed in Porto Rico lives up to the claims made by its inventor. The process, said to be successful after five years of experimentation, is reported by the Assistant Trade Commissioner at San Juan, and made public by the Department of Commerce.

According to the statement of the department, small pineapples are used ranging in size from 30 to 48 to the crate. The pineapples are peeled, cored and cut in thin slices in the plant. These slices are placed in drying bins heated by electric lamps, where hot air is blown over them. Temperatures vary during the drying process. The dried slices are treated with a light solution of sulphur dioxide to prevent fermentation. They are then pressed together and packed in No. 10 tins. It is said that cans opened after nine months have shown the fruit to be in good condition.

The owner has submitted samples to a number of European firms. In Spain he found considerable enthusiasm over the product and hopes to arrange for the distribution of the product there for the next pineapple harvest. Mangos have been dried in the same plant but it is not planned to dry that fruit on a commercial scale at the present time.

Congressional Attention Is Centered On Food Products

By Paul Wooton
Washington Correspondent

Amendments to Food and Drugs Act and Warehouse Act to Be Considered at Regular Session

Sugar Storm-Center in Tariff and Lobbying Activities—Agree on Milling-in-Bond Proviso

An increased tendency is being manifested on the part of Congress to enact national legislation to guide and regulate the processing and distribution of foodstuffs. This legislation is not for the most part of the restrictive type, but has its origin in the suggestions of those in the industry who have recognized the importance of adequate federal supervision.

An amendment to the Food and Drugs Act to provide for informative labeling of sub-standard canned foods has been sponsored by the National Canners' Association. The bill has been reported to both the House and Senate and favorable action is expected during the coming regular session. While the proposed act does not require the definition of commercial grades, it does provide that all goods adjudged to be inferior must be labeled as such. The Secretary of Agriculture is directed to fix a standard or quality for each type of canned food, except meat products and milk, the labeling of which is already authorized by federal statute.

While the consumer's protection is the main objective of the amendment, it is expected that much benefit will result to the canning industry, since the fact that canned goods of low grades can be sold without the consumer being able to distinguish them from the better grades until the can is opened, now constitutes a serious handicap to any effort to increase the demand for canned foods.

Another bill by those interested in the food industry that has received favorable consideration by the agricultural committees of the two houses of Congress is designed to amend the warehouse act so as to give the federal government more jurisdiction in licensing these establishments, thus giving warehouse receipts a greater value as to collateral. At present, bankers in Eastern financial centers are reluctant to issue loans on products in warehouses any great distance away, since there is no standard form of inspection for state warehouses.

Last spring a bill authorizing the Department of Agriculture to suppress unfair and fraudulent practices in the marketing of perishable agricultural commodities in interstate commerce was passed by the Senate. The bill is intended to prevent commission merchants and brokers from dumping or discarding foodstuffs without reasonable cause. Favorable action is expected in the House as soon as the regular session convenes.

At least one hotly debated feature of the tariff bill seems to have been settled. This is the question of milling flour in bond for export. Milling in bond, which has been defined as "virtually a 'milling-in-transit' of wheat moving through the United States," permits the entry of wheat from Canada without payment of duty. The Senate is in agreement with the House that this should not be allowed when the exporting is to Cuba, so that advantage is taken of the 30 per cent tariff reduction allowed by Cuba on flour from the United States under a reciprocity arrangement with that country.

Along with the House, however, the Senate on Oct. 14 gave its approval to milling in bond in general by rejecting Senator Walsh's amendment. This amendment would have required a 42-cent import tax on Canadian high-protein wheat when brought in merely to be made into flour for export, virtually prohibiting such milling in bond.

Rather than necessitate a conference, at which millers who have built up a large Cuban trade in flour made from Canadian hard wheat might hope for a reversal, Senator Capper withdrew his amendment, stating that no milled-in-bond flour could be shipped to Cuba under present tariff arrangements. The matter stands, then, as left by the House. Under this regulation, millers will be permitted to bring in wheat until 90 days after the enactment of the bill, and ship flour made from such wheat at any time without paying any duties. After 90 days have elapsed, however, all such flour going to Cuba will have to bear a duty equalling the tariff offset of 30 per cent which is allowed by Cuba to the United States. In general terms, the House bill requires that wheat milled in bond bear duties equalling any tariff offsets enjoyed by the flour when shipped to other countries.

American millers operating in the Buffalo area have built up a large Cuban business in milled-in-bond flour since this country put a duty on Canadian wheat. But a considerable share of their business, along with millers in the Seattle area, is with countries other than Cuba which have no tariff offsets. The proviso in the House bill will not affect this business.

Demand that all milling-in-bond operations be stopped came chiefly from the hard-wheat states of the Northwest and was based on the contention that if duties were applied to all Canadian wheat, even when milled for export, millers would export more flour made of domestic hard wheat.

Revelations by Harry A. Austin, secretary of the United States Beet Sugar Association, who detailed how the organization spent about $70,000 a year for the last seven years, much of it for the purpose of bringing about a higher sugar tariff, were made before the Senate lobby investigating committee on Oct. 16.

Of 30 sugar companies in the United States, Mr. Austin said, 19, representing 90 per cent of the domestic production, comprise the beet sugar association. They finance their organization by assessing themselves not to exceed one-half a cent a 100-pound bag of sugar they produce.

Mr. Austin held that, as a representative of a recognized trade association, his activities were perfectly legitimate, and that the greater part of his expenditures were for activities not directly related to legislation. He explained in detail the character and quantity of press releases which had been sent out on the sugar tariff question, and called attention to the fact that organizations in favor of a lower tariff for the benefit of Cuban cane sugar growers were also authors of many press releases.

An investigation by the Federal Trade Commission into an alleged combination of cottonseed oil mills to fix cottonseed prices, was directed by the Senate Oct. 21 when a resolution introduced by Senator Heflin of Alabama was adopted.

The resolution was amended at the suggestion of Senator Simmons to include cottonseed meal.

Oleomargarin Must Not Have "Del Monte" Label

The use of the trademark "Del Monte" on oleomargarin was forbidden the Del Monte Special Foods Company recently when the U. S. Circuit Court of Appeals upheld the decision of the San Francisco District Court in favor of the California Packing Corporation, which has long used this trademark.

The Special Foods Company claimed the right to use this mark, since the packing corporation had never manufactured or sold oleomargarin. The court held, however, that use of "Del Monte" was equivalent to marking the product "Made by the California Packing Corporation," in view of the extensive advertising and common familiarity of the public with the mark, and that the motive of the defendant was evidently to obtain the benefits of the advertising of the packing corporation.

The decision in this case is the reverse of that made almost a year ago, and reported in Food Industries of last December, in which the right of Tillman & Bendell, Inc., to use "Del Monte" on coffee was upheld. In that case, however, use of the mark since 1887 was a factor in the decision.

Pineapple Canners Have Good Year

A new high mark of 9,000,000 cases of Hawaiian pineapple will be set this year, it was predicted last week. Despite this great production, the demand for the canned product was so great that orders had to be curtailed.

The Hawaiian Pineapple Company recently adopted a plant expansion program that will practically double its capacity when completed, and which will cost in the neighborhood of $800,000. The increase will be carried out over a period of years, and will take care of the expected steady growth in the annual production.

The extension of pineapple growing also is being planned. The Hawaiian Pineapple Company is conducting experiments in growing in the Fiji Islands; the California Packing Corporation is working in the Philippines; Libby, McNeill & Libby are increasing their pineapple pack by cultivation contracts with homesteaders on the island of Molokai, and are investigating pineapple growing in Africa.

Upjohn Defends Infringement Suit of Wisconsin Alumni

Charges that the Steenbock patent for the irradiation of foods and medicines to supply vitamin D is being infringed by Upjohn's "Super D Fortified Cod Liver Oil" will be fought by the Upjohn Company, of Kalamazoo, Mich., as a result of a suit filed against Sargent's Drug Store, Chicago, Ill., retailers of the product.

Last July, the Wisconsin Alumni Research Foundation, to which the Steenbock patent had been assigned, brought suit against both the Sargent Drug Store and the Solar Research Corporation, of Chicago, for infringement of a patent which is held with the provision that the proceeds be devoted to scientific research. Some of the largest food and drug makers in the world are licensees under this patent.

The Solar Research Corporation failed to file an answer during the legal period, but the suit against the drug company will be defended by Upjohn.

Glass Container Meeting Has Record Attendance

A record number of members in the glass, cap and closure industry attended the semi-annual meeting of the Glass Container Association, held at the Royal York Hotel, Toronto, on Oct. 16-18. An address of welcome by Samuel McBride, Mayor of Toronto, opened the session on Thursday morning. Following an address by Philip I. Heuisler, president of the organization, Hugh P. Baker, head of the trade association department, U. S. Chamber of Commerce, stressed the value of such organizations in bringing about constructive development of the industry by co-operation.

The increase in the use of glass packages in the coffee trade was one of the features of the "New and Increased Uses" session. It was brought out that a suitably designed breather type closure permits the retention of the original flavor in addition to attractive appearance.

Karl L. Ford, director of research for the association, told of the service which is being rendered the user by tackling problems of packing from a scientific angle and in terms of the individual user's point of view. W. S. Richards reported on the work of the standardization committee. He urged that, despite the progress made, further simplification of all types of glass containers be made through standardization of general lines.

Charles R. Stevenson, business manager of the association, pointed out that during the past three years the association as a group had spent nearly a million dollars, and during that time there had been an increase in sales of about $18,000,000. To carry out the 1930 program, an appropriation of some $200,000 is being raised, based upon one-quarter of one per cent of the total sales of member companies.

Receiver Named for Cuban Sugar Firm

THE largest producer of raw sugar in Cuba, the Cuba Cane Sugar Corporation, has gone into the hands of a receiver by order of the U. S. District Court. John R. Thompson, president, was appointed receiver at the request of the company and security holders' committees.

Fish Byproducts in 1928

From a total annual catch of nearly 1,500,000 tons of all varieties of fish, valued at approximately $112,724,000, there were recovered in 1928 byproducts of about $9,750,000 value, the principal items, as listed by the U. S. Bureau of Fisheries, being:

	Tons	Value
Menhaden meal	36,695	$1,984,889
Pilchard (sardine) meal	23,201	1,404,114
Alaska herring meal	10,002	657,480
Cod-haddock meal	9,036	590,746
Tuna meal	6,780	439,982
Salmon meal	1,321	80,709
Shrimp meal	1,726	58,080
Maine herring meal	2,011	52,649
Crab meal	1,500	45,000
	Gallons	**Value**
Pilchard oil	3,825,786	$1,621,531
Menhaden oil	3,585,569	1,455,376
Alaska herring oil	2,543,600	1,015,555
Cod liver oil (U. S. P.) / Cod oil (tanning)	267,882	212,036
Salmon oil	171,590	64,930
Maine herring oil	166,055	57,974
Tuna oil	22,834	5,120

New Way of Freezing Fish Developed in Canada

A new process of fish refrigeration has been developed by the Biological Board of Canada, a research branch of the Department of Marine and Fisheries. Fish taken from the sea are immediately cleaned, washed and iced in the hold of the vessel. Those that cannot be butchered and frozen as soon as the ship reaches shore are placed in water slightly less salty than the sea, the water being kept between 30 and 31° F. by circulation through ice.

As rapidly as possible the fish are taken out, and the fillets cut into 5-inch pieces and placed in molds holding just half a pound. The blocks are wrapped in parchment, placed in metal frames and immersed in brine of zero temperature. A metal envelope separates the brine from the fish. Freezing takes place in about fifteen minutes, and the blocks of frozen fish are removed from the frames and packed in waxed cartons holding two half-pound blocks.

Fight Against Fruit Fly Appears to Be Won

There are so few Mediterranean fruit flies left in Florida that practically none can be located for experimental purposes, according to Dr. C. L. Marlatt, Chief of the Plant Quarantine and Control Administration. Intensive studies will, therefore, be transferred to Hawaii.

The success has been so complete that modification of the quarantine, releasing all areas except those within which infestations have been determined since July 31, was announced on Oct. 14 by Secretary of Agriculture Hyde. No infestation has been found since Aug. 27, it was made known.

Sterilization of grapefruit by heat without injury to the fruit has been successfully developed. They are heated to 110° F. for an eight-hour period, a very high humidity being maintained, subsequent to coloring. This sterilization is not applied to infested fruit, but is an added precaution following inspection.

Wheat Price Takes Big Drop But Rebounds

Following the lead of the stock market, the bottom dropped out of the wheat market for a few hours on Thursday, Oct. 24. Prices dropped 12 cents a bushel to new season lows for March and May deliveries. A reaction came soon afterward, however, and prices rose about 8 cents a bushel, making a net drop of 5 cents for the day. Prices were up another cent at the opening Friday morning. Export buying of American wheat for shipment to Europe was one of the reactive factors.

Dairies Industries Groups Meet in Toronto

Technical achievement of outstanding importance to the dairy industry was developed at the exposition and conventions held in Toronto from Oct. 21 to 26. The convention of the International Association of Ice Cream Manufacturers, held on Oct. 21-23, was featured by technical advancement reported at the production session. The convention of the International Association of Milk Dealers, held Oct. 24-26, included symposiums of far-reaching importance on improvement of milk supply, development of laboratory technique, the use of latest equipment, and the employment of better merchandising methods.

At the Dairy Engineering Meeting, held on Oct. 24 under the sponsorship of the American Society of Agricultural Engineers, papers were presented in regard to problems of dairy machinery design. Among the subjects discussed were the following: "Heat Transfer in Dairy Equipment," "Application of Direct Expansion to Dairy Refrigeration, and "Pseudo-Plasticity of Skim Milk."

"Eskimo Pie" Patent Melts Away in Court

The patent on the "Eskimo Pie," well known chocolate-covered confection, was declared invalid by the Circuit Court of Appeals for the Third Circuit on Oct. 3. In upholding a ruling of the lower court, it was shown that the basic principles behind the confection were mentioned in a booklet by Val Miller in 1907. Miller made chocolate-covered ice cream in the form of balls, calling them "ice cream cannon balls," and the court ruled that the brick form of "Eskimo pie" was "well known to everybody," and that this distinction did not constitute an invention.

It was also ruled that commercial success is not a criterion of patentability except in doubtful cases.

Dry Skim Milk Standards Go Into Effect Nov. 1

A schedule of dry skim milk grades and standards, established by the American Dry Milk Institute with the cooperation of the Department of Agriculture, will go into effect on Nov. 1 after considerable work on the part of the Institute's standards committee in setting up grades, methods of enforcement, and the organization of a testing laboratory for the checking of dry milk placed on the market.

Three grades, "extra," "standard," and "third" grade, have been set up. Exact specifications for the three grades have been decided upon, milk falling into the first two classes being fit for use in foods for human consumption. Adoption of the standards is expected to lead to a continued expansion in the use of this product.

NEWS IN BRIEF

A study made recently by Prof. W. F. Ogburn, of the University of Chicago, shows that since 1900 the number of people employed in canned food factories has increased twice as fast as the population; the number of delicatessen dealers three times as fast, and the number of waiters employed in restaurants four times as fast.

Consumption of baking powder in the United States in one year totals 155,941,240 lb., according to an investigation by the Calumet Baking Powder Company. Out of the 27,587,672 homes in the country, 24,801,317 use baking powder, the average home using baking powder consuming 5.76 lb. per year, the investigation revealed.

The number of beef cattle in the United States decreased by 28 per cent between Jan. 1, 1920, and Jan. 1, 1929, according to figures of the Bureau of Agricultural Economics.

Total sugar melt of fifteen United States refiners for the period from Jan. 1 to Oct. 5 was 3,950,000 long tons, according to the Sugar Institute, Inc., comparing with 3,600,000 long tons in like period of 1928.

The International Chocolate and Cocoa Congress will meet in Antwerp in 1930.

Reynolds Brothers, Inc., the holding company formed to handle a large portion of the investments of the brothers R. S. and C. K. Reynolds, owns a large block of stock of Gold Dust Corporation and Standard Brands, Inc.

Langendorf United Bakeries, Inc., has purchased the Martin Baking Co.—an old-established concern of San Francisco. Other southern California purchases are contemplated.

A wide mouth bottle for catsup appears to have a distinct public appeal, and Curtice Brothers, who have adopted it after a sales test, expect to feature it in their advertising.

Ripe olive growers in California have organized a corporation known as California Ripe Olive Distributors, Ltd., to develop markets and stabilize prices.

A World Dairy Congress will be held in Denmark in 1931, according to a Department of Commerce report. The King of Denmark will be Protector and Ministers for Agriculture and for State will preside at the meeting.

Butter stabilization by means of the Paterson plan is functioning smoothly and satisfactorily in Australia, with an estimated gain to Australian dairy farmers of $31,600,000 during the three years of the operation of the plan. The export bounty on butter is 9 cents per pound, and the levy 3½ cents per pound. Legal means have been taken to combat the manufacture or importation of margarin to the various states since it would become a real competitor of butter at the high prices maintained by the stabilization scheme.

The peach packing season was over 98 per cent completed on Oct. 1, and the total pack at that time was 7,912,070 cases of cling peaches and 436,441 cases of free peaches in California.

A food products mart, possibly the largest of its kind in the world, will form a part of the huge Chicago Loop Merchandise Mart.

The packing industry, through the American Institute of Meat Packers, is making wide use of research to improve efficiency, it was stated by W. Whitefield Woods, president of the organization, at the annual convention in Chicago on Oct. 21. Besides carrying on research into improved curing methods, lard manufacture and other subjects in its own research laboratory, it is financing research at a number of institutions on various phases of livestock production, on meat cookery, and on business problems. As a result of experiments, hams may now be cured in less than one-half the time formerly required.

Bakers' Association Holds Annual Gathering

The 32nd annual convention of the American Bakers' Association, held in Chicago during the last week in September, brought to the 1,012 men who registered new knowledge and inspiration for the baking industry. The future of the independent baker was discussed by Matthew Carpenter, who pointed out that the progressive methods of the big bakeries are causing the rest of the industry to join in the progress if they are to live.

Henry Stude, president of the association, spoke on the progress of the industry as a whole. He stressed the services of the association in combating unethical practices. Ernest Goettsch, general secretary of the National Trade Association of Germany, brought greetings from the German bakers and presented a paper to the group.

Group meetings for cake and retail sections, allied trades section, sales promotion section and bakery engineers were of great interest.

Advantages and disadvantages of sliced bread were discussed at the engineers' session. Six factors of this startling development in the bakery industry were treated; the keeping quality, the matter of proper formula and process, the added cost of production, methods of synchronizing, slicing and wrapping machines, mechanical difficulties with slicing machinery, and the cause and prevention of mold. While the product has not been accorded unanimous approval, being classified as a fad by some observers, the consensus at the meeting was that business in sliced bread is increasing rapidly and is destined to assume still greater importance.

The problem of "freshness" came in for much interesting discussion. It was reported that sliced bread lost moisture at a rate definitely more rapid than the unsliced variety. Nevertheless, investigation showed that "freshness" was judged not by moisture content but by the softness of the loaf. The lowered mechanical resistance of the sliced bread crust made the loaf feel softer than whole loaves of the same age.

Trend to Mergers Continues; Many More Are Rumored

Lever Brothers and Margarine Union Merge—Continental Can and Owens-Illinois Glass Center of New Group—American Can and Anchor Cap; Hershey, Kraft-Phenix and Colgate-Palmolive Peet Involved in Reports—Many Dairy Mergers

AMALGAMATION of Lever Brothers, Ltd., and Margarine Union, Ltd., is hailed in Great Britain as the greatest industrial merger since the war, and will have a world-wide effect upon the trade in soap, margarin, vegetable oils and oil cake. While the most profitable unit in the Lever Brothers organization is the Lever Brothers Company, of Cambridge, Mass., there has yet been no intimation of the effect that the merger will have upon the policies of the American branch. Rumors that Procter & Gamble Company would be brought into the combination have been denied.

Announcement was made last month that the Owens-Illinois Glass Company —itself a product of a recent merger of the Owens Bottle Company and the Illinois Glass Company—was involved in a $75,000,000 deal which made it part of the Continental Can organization. It was reported at that time that this was merely a preliminary step in the formation of a huge $300,000,000 holding concern to be known as Continental Containers, Inc., which would eventually take over many other manufacturers of tin and glass containers. Credence was given this report by the announcement on Oct. 15 that the Continental Can Company had acquired the Nashville Corrugated Box Company, of Nashville, Tenn., manufacturer of corrugated shipping containers. Last April, the McDonald Machinery Company, manufacturer of can-making machinery, was absorbed.

On Oct. 17 it became known that Continental Containers, Inc., had filed a charter with the Secretary of State of Delaware to transact business in stocks, bonds, inventions and other devices. Stock consists of 5,000,000 no-par common shares and 80,000 shares of $100 par preferred. The Continental Can Company has called for redemption on Jan. 15 of preferred stock outstanding, amounting to nearly $5,000,000 at the end of last year.

Rumors Involve American Can

It also has been reported, though without verification, that the American Can Company, largest manufacturer in this field in the world, has virtually completed negotiations for a merger with the Anchor Cap Corporation, holding company which controls a complete organization for the manufacture of hermetically sealed glass containers.

The Kraft-Phenix Cheese Corporation recently absorbed ten smaller companies, mostly dairy concerns. The companies acquired are the Southern Dairies, Inc.; the Tuttle Cheese Company, the business and assets of John E. Cain, Crawford Farms, the Gelfand Manufacturing Company, the Henard Mayonnaise Company, the Missoula Creamery, Inc.; the Red Rock Dairy, the Sanquoit Valley Dairy Company, Inc., and the Sentinel Creamery, Inc.

Conversations looking to a merger of the Kraft-Phenix Cheese Company, the Hershey Chocolate Company, the Colgate-Palmolive Peet Company and several other companies have been carried on with National City Bank (New York) interests, it was said two weeks ago. The company formed by the proposed merger would be similar in structure to Standard Brands, Inc., the holding company recently organized under the sponsorship of J. P. Morgan & Company to control the Fleischmann Company, Royal Baking Powder and other food concerns. At the end of last year, the Hershey company had assets of more than $25,000,000, while the assets of Kraft-Phenix amounted to more than $38,000,000, and of the Colgate company to more than $62,000,000.

Canada Dry Expanding

The purchase of G. B. Seeley's Sons, Inc., and Chelmsford Ginger Ale, Inc., by Canada Dry Ginger Ale, Inc., represents the first step in a program of expansion, according to P. D. Saylor, the president.

Carnation Milk Products Company has arranged to acquire Albers Brothers Milling Company, of Oregon, millers of cereals, flours, mixed feeds and importers and exporters of grain. The company has also acquired the American Creamery Company, of Oakland, Calif., which does an annual business of $1,800,000.

Dairies have featured in a number of combinations. The Borden Company has acquired the Adirondack Dairy Company, Benson Dairy Company, C. Carlsen Dairy Company, Winnetka Dairy Company, Wint's Dairy and the Hohlfelder Dairy Company. The National Dairies Products Corporation has acquired the Bowman Priebe Ovson Company, Chicago; the Matthews Selected Dairies Company, Cincinnati, and the Youngstown Sanitary Milk Company, Youngstown, Ohio.

Metropolitan Dairy Products, Inc., has been formed for the acquisition of the Middletown Milk & Cream Company, Inc.; the Slate Hill Milk & Cream Company, Inc., and the Tietjen & Steffen Company, Inc. The Middletown company in addition to its own properties operates the Suburban Milk & Cream Company and has an option to purchase it. The Slate Hill company operates the Rich Creamery Company. The merging companies are in Hamburg, N. J., and Mechanicstown, Slate Hill, Dayton, Newport and the Bronx in New York.

Negotiations are under way looking to a merger of the Foremost Dairy Products Company and the Southwest Dairy Products, Inc., according to information reaching the New York financial district on Oct. 18. Such a transaction would create a company with about $14,000,000 of assets.

Twelve companies, scattered throughout the Middle West, in Michigan, Iowa, Missouri, Colorado and Nebraska, and having combined sales last year of $27,658,000 have been absorbed in an expansion program undertaken by the Beatrice Creamery Company.

Libby, McNeil & Libby have purchased the Central Canning Company, with plants at Colby and Dorchester, Wis., and the Pillsbury Flour Mills Company has purchased the Astoria Milling Company, of Astoria, Ore., the newly acquired mill having a capacity of 4,500 barrels of flour per day.

The entire business properties of the Portland Vegetable Oil Mills Company have been acquired by the Glidden Company.

The Duffy-Mott Company, Inc., New York, and the Standard Apple Products, Inc., Hamlin, N. Y., recently completed a merger which makes the combination one of the largest concerns in America devoted to the manufacture of cider, cider vinegar, and evaporated apples. The new organization, with total assets of approximately $2,000,000, will continue to use the old name of Duffy-Mott Company, Inc.

Decree Against Meat Packers Upheld by Wholesalers

Hearing has been postponed until Nov. 6 on the petition of the packers for modification of the consent decree pending in the Supreme Court of the District of Columbia. The proposal of the four meat-packing companies that they should be permitted to engage in the retail distribution of meat and in the manufacture and distribution of a large variety of food products, which is enjoined by the decree entered in 1920, is supported by farm organizations, but is strenuously opposed by the American Wholesole Grovers' Association.

The Wholesale Groceries' Association has intervened in the proceeding for the purpose of protecting the decree against modification or abrogation. In a letter to Senator Copeland, of New York, J. H. McLaurin, president of the association, urges him to support the Nye resolution, now pending in the Senate, for investigation by the Federal Trade Commission of the present status of the decree, the petition of the packers, the public policies involved, and the propaganda favorable to modification which the packers are alleged to be issuing.

Pasteurization Fails to Kill Some Bacteria, Says Report

The recently recognized fact that a great variety of bacteria survive, or actually grow, in the hot milk during the process of pasteurization is explained in a recent report of the New York State Agricultural Experiment Station.

The methods of making bacterial counts that have been used in controlling the efficiency of pasteurizing plants fail to reveal many of these heat-resistant and heat-loving bacteria, so that little effort has thus far been made to eliminate them from the pasteurized product, according to this paper, which has been prepared by Paul S. Prickett, former assistant bacteriologist at the station and Dr. Robert S. Breed, station bacteriologist. Bacteria are found to exist quite frequently in large numbers in the product of large, well-operated pasteurizing plants. Fortunately, none of these organisms injures the milk for human consumption.

From the station investigations it appears that the original source of these bacteria is in the surface layers of soil. From this source they naturally spread to any material that undergoes spontaneous heating, such as hay in the mow, ensilage, green grain, and the like, and so occur in the dust of the stable. Even under very clean conditions the dairyman can scarcely avoid getting some of them into the milk that he delivers at the pasteurizing plant. Here, under the favorable conditions that heat-loving bacteria find in large plants where hot milk passes through the equipment for hours at a time, these bacteria grow to enormous numbers, unless corrective measures outlined are adopted to bring them under control. "Bacteria that Survive and Grow During the Pasteurization of Milk and Their Relation to Bacterial Counts," is the title of the publication.

What Is a Sardine?

Further troubles for the California fish canner are predicted from the recent labeling decision of British South Africa, where the customs authorities have ruled that the California product "herring in tomato sauce" is misbranded, since experts employed by protesting British and Dutch exporters have advised that herring do not frequent the Pacific Coast waters.

Although the ruling is held in temporary abeyance, pending proof that the California product is cutting into the other business, the U. S. Department of Commerce is of the opinion that it will be eventually enforced. However, the original ruling regarding sardines has been revised and the California sardine, or pilchard, may be sold as a "sardine." This ruling, however, is subject to change and possibly may be again revised to require labeling the California fish to conform with the requirements for labeling for sale in the United Kingdom.

New Pickle Company

The General Pickling and Food Products Corporation, New York City, has been chartered at Albany with $150,000 capital to manufacture pickles, and to preserve and can foods. Nathan Friedman, 1057 Van Nest Avenue; Benjamin Bernstein, 243 Eden Avenue, Bronx; Frank Grubauer, 4833 250th St., Little Neck, L. I., are directors and subscribers. Joseph W. Umans, 277 Broadway, New York City, is attorney for the corporation.

PERSONALS

DR. H. E. BARNARD, organizer and former president of the American Institute of Baking, has been permanently retained as food consultant by Dougherty Food Products, Inc., Muncie, Ind., cake bakers.

A. D. BURKE, head of the dairy department of the Oklahoma A. & M. College, has resigned to accept a similar position at the Alabama Polytechnic Institute at Auburn, Ala., where a new dairy plant is about to be constructed.

CARLE C. CONWAY, president of the Continental Can Company, has been elected a director of the United States Rubber Company.

RALPH T. K. CORNWALL has resigned the position of assistant professor of organic chemistry at the University of Pittsburgh, and is now senior microanalyst at the Hygienic Laboratory, U. S. Public Health Service, Washington, D. C.

ERNEST FILSINGER, vice-president of the Royal Baking Powder Company, in charge of foreign sales, recently flew the entire length of Africa on a commercial trip. Twenty-six days were required to make all his calls that otherwise would have required at least four months if he had used rail, steamer and highway transportation.

ROBERT M. FLANINGAM, Columbus, Ohio, for more than ten years engaged in the flour business as a salesman for various mills, has been appointed Ohio representative for the Lukens Milling Company, Atchison, Kan.; the Christian Mills, Minneapolis, Minn.; the Crite Milling Company, Circleville, Ohio; and the Hulsheiser Milling Company, Newark, Ohio.

KARL L. FORD has been appointed Acting Director of Research, of the Laboratories of the Glass Container Association, succeeding Dr. S. H. Ayres, who recently resigned.

AUGUST C. FRUEHAUF, formerly president of the Fruehauf Trailer Company, of Detroit, was elected chairman of the board at its July 25 meeting. Other elections were: Harvey C. Fruehauf, president; Harry R. Fruehauf, vice-president and director of purchases; Earl L. Vosler, vice-president and treasurer; G. W. Chamberlain, vice-president and director of sales; Roy W. Jacobs, secretary and assistant treasurer.

CLAUDE GREGG, president of the Vincennes Packing Company and Mayor of Vincennes, Ind., has purchased the Vincennes Commercial—a morning daily newspaper.

ADRIAN D. JOYCE, president of the Glidden Company, announces the removal of his offices to 1958 Union Trust Building, Cleveland, Ohio.

D. H. KILLEFFER has relinquished his position as technical director of the Dry Ice Corporation of America, New York City, and is now in charge of licensing of equipment and handling of equipment problems. C. L. Jones, formerly in charge of manufacture, is now also in charge of research and development.

D. H. PROCTOR, Chicago, Ill., has been put in charge of the information service for the American Dry Milk Institute. Mr. Proctor was for seven years connected with the McGraw-Hill Publishing Company, specializing on the advertising of food products and food factory equipment. He succeeds C. S. Darling, who recently resigned his position to take up work with the 4-One Box Company.

D. H. Proctor

NORMAN KING, agriculturist for the Pioneer Mill Company, will succeed Walter Wendt on the personnel of the experiment station of the Association of Hawaiian Pineapple Canners. Dr. J. L. Collins, associate professor of genetics at the University of California, will take up the seedling work of Prof. F. G. Krauss, who will hereafter devote all his time to his work at the University of Hawaii. Dr. M. B. Linford, formerly of the University of Wisconsin, and C. P. Sideris will be in charge of investigations in pathology and physiology, respectively. H. R. Hagen, professor of zoology at the University of Utah, has been added to the department of nematology, where he will be associated with Dr. G. H. Godfrey.

E. L. OVERHOLZER, professor of pomology at the University of California College of Agriculture, is now on the high seas aboard the "M. S. Silverhazel," of the Kerr Line. This ship was selected for the ocean-going laboratory on fruit shipments described in the August issue of FOOD INDUSTRIES. Upon his return, Professor Overholzer will take up his new duties in the pomology department of the University of Washington, Seattle, Wash.

DR. PAUL S. PRICKETT, formerly of the New York State Agricultural Experiment Station, is now bacteriologist for Mead Johnson & Company, Evansville, Ind., manufacturers of infant diet materials.

A. M. ROSENTHAL has been elected president of the Happiness Candy Stores, Inc., to succeed Hugh Cassidy.

W. G. SHIPLEY, of the Shipley Baking Company, Fort Smith, Arkansas has been made a member of the City Planning Commission of that city.

ALFRED P. WALKER, former president of the Standard Milling Company, and William J. Brown, Jr., have been elected to the board of directors of the All-America General Corporation.

DR. HARVEY W. WILEY, internationally known chemist, celebrated his 85th birthday on October 18th. Among the congratulatory messages received by him was one from President Hoover, which read in part, "You have long deserved, and I trust may be spared, to continue to enjoy, nation-wide appreciation of your many services in the cause of health, an appreciation in which I cordially share." Although Dr. Wiley had been suffering from a minor ailment he was sufficiently recovered to receive his friends in person.

OBITUARY

WILLIAM H. BARNARD, long one of the leaders in the salt industry, died of heart disease recently at his home in New York City. Mr. Barnard, who was 68 years of age, was treasurer of the International Salt Company of New York and New Jersey and a director of a dozen other corporations.

CHARLES BOLT, formerly chairman of the executive committee of the Owens Bottle Company, died in New York City the day after his work on the merger of his company with Continental Can had reached a successful culmination. Mr. Bolt was 61 years old and, although his home was in Santa Barbara, Calif., he was accustomed to spend part of the year in the East.

CHARLES LINCOLN CARPENTER, general manager of the Central Aguirre Sugar Company, Central Aguirre, Porto Rico, died suddenly of heart disease on Sept. 28 while on a canoe trip in Canada.

H. J. KREBS, founder of the chemical concern that became the National Ammonia Company, died at Wilmington, Del., on Oct. 7 at the age of 82 years. Mr. Krebs was born in Denmark, coming to this country in 1879. Early in his career he was associated with the Delaware Beet Sugar Company. As an engineer he built the first artificial ice plant in Wilmington, Del. At the time of his death he was chairman of the board of directors of the Krebs Pigment & Chemical Company.

A. P. JORDAN, general manager of the Lactol Corporation, San Francisco, manufacturer of special baking ferments, died suddenly Oct. 9 of heart failure while on a motor trip to Eureka, Calif. He was 32 years old, and for a year or so previous to his death had been an enthusiastic investigator of lactic-acid fermentation and bacterial proteoclastic enzymes in bread baking.

DR. E. E. SLOSSON, director of *Science Service* and author of numerous books on popular science, especially in the field of chemistry, died in Washington, D. C., on Oct. 15, after an illness of several months. Mr. Slosson, whose age was 64 years, was professor of chemistry at the University of Wyoming for a number of years, and also was chemist for the Wyoming Agricultural Station.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Alcohol Plant—Utah Industrial Alcohol Co., S. D. Huffaker, Secy., Salt Lake City, Utah. plans the construction of an alcohol plant at Springville. Estimated cost $60,000. Architect and engineer not selected.

Bakery—Amrheim Bakery, 810 E. N. Grand Ave., Springfield, Ill., will soon award contract for the construction of a 1 story bakery. Estimated cost $55,000. W. E. Long Co., 155 North Clark St., Chicago, is architect and engineer.

Bakery—Fischer Baking Co., 242 Livingston St., Newark, N. J., is receiving bids for the construction of a 1 story, 100 x 125 ft. bakery at Railroad and 5th Ave., Asbury Park. Estimated cost $100,000. W. E. Long Co., 155 North Clark St., Chicago, is architect and engineer.

Bakery—Franklin Bakery, 17 Nestor St., Franklin, N. J., awarded contract for a 2 story, 28 x 185 ft. bakery to Henry Nightingale, 1055 East 22nd St., Paterson. Estimated cost $40,000.

Bakery—C. F. Hale, 6619 Franklin Ave., Los Angeles, Calif., awarded contract for the construction of a 1 story, 48 x 100 ft. bakery at 527-31 East 16th St. to L. W. Crookshanks, 6619 Franklin Ave., Los Angeles.

Bakery—National Biscuit Co., 85 9th Ave., New York, N. Y., awarded contract for the construction of a 3 story bakery on Ferry St., Newark, N. J., to White Construction Co., 95 Madison Ave., New York, N. Y. Estimated cost $400,000. Machinery and equipment including ovens, baking machinery, chain conveyors, motors, etc.

Bakery—New England Pie Co., 2002 Fourth Ave., Detroit, Mich., awarded contract for the construction of a 2 story, 42 x 95 ft. bakery on Elizabeth St., to Hazleton & Clark Co., 1038 Michigan Theatre Bldg., Detroit. Estimated cost $50,000. Equipment will be required.

Bakery—Van De Kamp Holland Dutch Bakery Inc., J. E. Hopkins, 406 South Main St., Los Angeles, Calif., is receiving bids for the construction of a 4 story bakery at Hollywood. Estimated cost $500,000. McCormick Co., Inc., 121-127 South Negley Ave., Pittsburgh, Pa., is architect.

Bakery—Ward Baking Co., Albany St., Cambridge, Mass., awarded contract for reconstruction and alterations to 2 and 3 story bakery to Holtz-Fairfield Co., 7 Water St., Boston.

Bottling Plant — L. R. Croce, Inc., 930 Summerfield Ave., Asbury Park, N. J., will soon award contract for the construction of a 1 story bottling plant. Estimated cost $40,000. C. B. Cook, Asbury Park Trust Bldg., Asbury Park, is architect.

Cannery—Filice & Perelli, Gilroy, Calif., is having plans prepared for the construction of a 1 story cannery near Ford factory site at Richmond. Estimated cost $300,000. W. Knowles, 1214 Webster St., Oakland, is architect.

Cannery (Fish)—J. Crivello, Monterey, Calif., plans the construction of a fish cannery at Richmond. Estimated cost $125,000. Architect not selected.

Creamery—Colfax Creamery Co., Colfax, Wis., awarded contract for a 2 story, 58 x 94 ft. creamery to Tschopp-Burch-Camastral Co., Chippewa Falls. Estimated cost $39,866.

Creamery — Dairy Products Co., Kingsville, Tex., awarded contract for the construction of a 1 story creamery to G. Tillman, Kingsville, Tex. Estimated cost $45,000.

Creamery—Mistletoe Creameries, Alice, Tex., awarded contract for the construction of a 40 x 60 ft. creamery to J. A. Smith, Alice.

Creameries, Packing and Distribution Plants, etc.—Swift & Co., Union Stock Yards, Chicago, Ill., awarded contracts for the construction of a creamery at Paris, Tex., to J. T. Taylor, 707 First National Bank Bldg., Fort Worth, Tex., $150,000, also at Macon, Ga., to Norwood-Griffin, Bona Allen Bldg., Atlanta, Ga., $30,000; contract for packing plant at Morgan and Harriet St., Evansville, Ind., to Scarborough & Davies Co., 710 Old St. Bank Bldg., Evansville. $51,000, and distribution plant at Massachusetts Ave. and Magazine St., Dorchester, Mass., to McLean Co., 44 School St., Boston; plans a 1 story, 70 x 100 ft. warehouse at Johnstown, Pa.

Dairy—Gold Leaf Milk Co., 8135 Exchange Ave., Chicago, Ill., plans the construction of a dairy. Estimated cost $100,000.

Dairy Plant—Hughson Condensed Milk Co., Hughson, Calif., plans to rebuild dairy plant destroyed by fire. Estimated cost $50,000.

Dairy — McCormick Co., Inc., 121 South Negley Ave., Pittsburgh, Pa., Archt., will receive bids until Nov. 4 for the construction of a 3 story dairy at 3380 Emily St., Pittsburgh, for Islay Dairy Co. of Pittsburgh, C. Islay, Pres., 1033 Mahoning Ave., Youngstown, O. Estimated cost $200,000.

Ice Cream Plant—Frostkist Ice Cream Co., 271 East Water St., Portland, Ore., will receive bids about Nov. 1 for the construction of a 2 story, 100 x 160 ft. ice cream plant, office, etc., at 11th, Taylor and Belmont Sts. Estimated cost $50,000. Machinery and equipment including pumps, boilers, refrigeration equipment, etc., to cost $30,000 will be required.

Ice Cream Plant Addition — General Ice Cream Co., 185 Cambridge St., Cambridge, Mass., awarded contract for a 3 story, 55 x 80 ft. addition to ice cream plant on East Second St. to J. W. Duff, Inc., 146 Summer St., Boston. Estimated cost $45,000.

Ice Cream Plant—Louisiana Ice & Utilities Co., Baton Rouge, La., is having plans prepared for the construction of a 2 story, ice cream and milk plant. Estimated cost $60,000. Sam Stone, Jr., & Co., Masonic Bldg., New Orleans, are architects.

Condensed Milk Plant — Owner, c/o A. C. Eillis, Citizens State Bank, Hiawatha, Kan., is having plans prepared for a 2 story condensed milk plant. Estimated cost $50,000. R. T. Nuamaker, 700 Citizens Bank Bldg., Tayler, Tex., is architect. Douthitt Engineering Co., 139 North Clark St., Chicago, Ill., is engineer.

Misleading the Public

IT IS ASSERTED that the scientist is the only man today who has anything to say, but that he is incapable of saying it. Hence when someone else does the job for him it is all the more important that what is said should be correct.

In the September issue of the *Ladies' Home Journal* Dr. Paul de Kruif lets himself go at considerable length under the title "Before You Drink a Glass of Milk — ." In this he describes, interestingly but sensationally, the work of Alice C. Evans on the relationship between the bacteria causing contagious abortion in cattle and undulant or Malta fever in man.

The article is objectionable more for its tone and for its sins of omission than for any specific errors. Only once, and that almost incidentally, far on in his story, does he mention that *Brucella abortus* and *Brucella melitensis* are destroyed by pasteurization. There is, in fact, a wide margin of safety in the present pasteurization process, which fact it would be well for his readers to know.

He does not distinguish between the different types found in humans, cows, goats and pigs, nor their relative virulence. The bovine *Brucellae* themselves appear to vary widely in their effect on humans. When he insinuates further, on the basis of one case, that human abortion is due to these bacteria, he steps far beyond the scientific truth.

As an additional argument in favor of pasteurizing milk the article has some justification. But certified milk is by no means as unsafe as he states. Progressive producers of this have for some years past used the blood test for contagious abortion on all cows brought into their herds. Where correctly applied this is probably as accurate in its sphere as the tuberculin test is for "T.B."

The whole question is still an unsettled one and much work is being done to clear it up, with the full support of the certified milk producers. Meanwhile it should be emphasized that pasteurized milk and all manufactured milk products are safe in this respect, owing to the heat treatment they receive. There is nothing as yet to "get het up over." The facts will come and with them any further measures necessary for the safety of certified milk.

Popularity of Canned Pineapple Shown By Increased Growing Areas

A RECENT ANNOUNCEMENT from the Pacific Coast shows strikingly the popularity of canned pineapple. Three of the largest canners of this fruit in the Hawaiian Islands have announced their intentions of investigating additional areas for growing and canning pineapples. One is turning his attention to the Phillipines, another to Fiji, and the third to parts of Africa. These are not "fly-by-night" concerns seeking to do a little wildcatting or blue-sky promoting but three of the most astute groups in the business. Although the opinion among pineapple experts seems to be that it will be some time before pines grown in any of the areas being investigated will equal those of Hawaii in size or excellence in quality, nevertheless, they believe to be well worth while the extensive and expensive experiments necessary to the development of new areas.

It is estimated that the Hawaiian pack this year will be upward of 9,000,000 cases. Just what will be the effect of extending this figure by bringing new regions into production is a matter of conjecture. But on the face of this announcement it certainly argues well for the hold this delectable canned food product has on the consuming public throughout the world. And this hold in turn is only another example of the triumphs of the food and canning technologists who have made a fruit, deservedly popular in the fresh state, always available. The pineapple canner, together with the exponents of scientific agriculture who are responsible with him for the success of this food product, may justifiably "point with pride" to their achievements.

What Causes Mottled Cheese?

BUYERS OF CHEESE for manufacturing purposes, as well as cheese manufacturers, will be much interested in a paper published by G. F. V. Morgan in *The New Zealand Journal of Agriculture*, vol. 38, 1929, page 259, on the subject of "Mottling in Colored Cheese." Anyone who has had experience with cheese knows that a mottled cheese is one that will soon be rancid and that the light colored spots are the ones which first develop an off-flavor. Many explanations have been given for this phenomenon. One frequently heard is that the rennet was at fault—that many immigrant cheese makers insisted on making their own rennet instead of using a superior commercial product.

According to Morgan, the fault lies in the expression of the white fatty whey after pressing, rather than its occurring during the last stages of cheddaring. He does not implicate rennet at all. The whey is an excellent medium for bacterial growth, a fact that probably accounts for the off-flavor first developing at the white spots, and indicates that the mottling is not the result of bacterial action but is the cause of it. Mottled cheese, therefore, is not well-made cheese.

The Food Manufacturer Becomes a Farmer

ONE COROLLARY of a buyers' market, such as the present, is that the manufacturer finds his margin of profits so reduced that he must take steps to safeguard them both at the raw material end of his process and at the distribution end. Generally speaking, it would appear that production of raw materials and distribution of finished products are conducted in more wasteful fashion than is the industrial process involved in the manufacture of food. At any rate, striking economies have been effected in instances where food manufacturers have applied to the production of raw materials the principles of management used in the plant. There is, for example, in the vicinity of New York, a dairy farm which can be so called only because it is out in the country and has cows on it. Actually, it is a factory in which the machines are cows, and the milker and farm hands are machine operators. It bears no more resemblance to what is usually thought of as a dairy farm than the "Leviathan" bears to one of Columbus' caravels.

A somewhat different "factory farm" in which the machines are asparagus plants is described elsewhere in this issue. The high cost of growing and poor quality of products offered to canners by independent growers prac-

tically forced the canners into the farming business. From the application of factory methods to scientific farming have resulted economies in production and improved quality of finished products that would have been well nigh impossible under the old system.

Is it possible that this method will revolutionize our agriculture? It may be many a day before the miller will grow his own wheat in order to get a grain of the quality he desires, or the packer of pork products will run his own stock farm to get a side of bacon of superior quality, but it is not difficult to visualize the economy to society of the farming and milling operations or the stock farming and packing operations being under a single management, with scientific control applied to both. Though it may sound Utopian, two successful instances are already in existence, and undoubtedly others will follow. If such a system had been in vogue among the California peach canners they probably would not have found themselves in the predicament they faced in the 1929 season.

Fill In Your Census Reports

BECAUSE of the universally recognized necessity for basic data as a prerequisite to the proper solution of practically all major problems with which present-day industrialists are confronted, it is greatly to be desired that all requests for information coming from the U. S. Census Bureau be complied with fully and at as early a date as is possible.

Plans for the next census of industries contemplate the collection, collation, and summarization of the most comprehensive set of data so far gathered on the operations of American industry. No manufacturer need fear any possible harm from a frank statement of his operating details; all census reports are absolutely confidential, under the law. Those who will be most helped by this governmental activity are none other than the establishments from which the data are to come. In addition to this aspect of enlightened selfishness, hearty co-operation is called for by a proper regard for the social welfare, and should be extended by all of us.

"Coal Tar" Dyes Again

THAT "COAL TAR DYES" and "synthetic flavors" are unwholesome is an impression still extant in some quarters, is illustrated by a recent damage suit instituted by a Pacific Coast bottler of carbonated beverages against the publishers of a farm paper widely circulated in the Western States. In a campaign for the passage of a bill declaring the labeling of beverages with fruit names illegal unless the beverage actually contained the juice of the fruit named, the editor of the farm paper used such epithets as "synthetic beverage barons," and "coal-tar crowd" when referring to the bottlers and "swill," and "coal-tar substitutes for fruit drinks" when referring to their products. That these terms injured the business of the plaintiff, particularly in the rural districts, was the basis of the suit, which has recently been settled, more or less amicably, out of court.

Regardless of the merits of this particular case, the time has come for definitely discarding the illogical and unreasonable presumption that a food with color or flavor other than that directly derived from some fruit or vegetable is *ipso facto* to be condemned as unwholesome. Food Industries has already voiced its disapproval of continued use of the terms "coal-tar dyes and flavors." They are simply labels; hangovers from the turgid language in which the dissolute practices of pre-pure-food-law days were attacked.

All colors admitted for certification for use in foods have been rigorously tested in government laboratories for both chemical impurities and physiological effect. They have been proved harmless. Most of the esters and ethers used in compounding fruit flavors actually occur in greater or less amounts in fruits and certainly cannot be construed as unwholesome in the very minute quantities ordinarily ingested. Every chemist knows that the fruity esters in a pure state usually are so strong in odor and taste as often to be positively disagreeable; it is only by dilution and blending to the approximate concentrations occurring in Nature that the requisite bouquet is obtained.

The extraction of the flavoring and odorous principles actually existing in fruits or flowers is an exceedingly ticklish piece of work, but the preparation of fruity esters is relatively simple. Again, the preparation of fruit juice concentrates for beverage use has been far from satisfactory, generally, though a few excellent products have been made. Under these circumstances there is every reason to condemn the bottler who claims true fruit juices in products devoid of them but none to condemn him who puts out a "fruit flavored" drink—something quite different from a "fruit juice drink"—though the flavor has never been within miles of a fruit.

Are Milk-Products Plants Equally Careful?

THE QUALITY of milk and cream imported from Canada is now on a very high standard, according to the report of the official inspectors of the U. S. Department of Agriculture who supervise inspection for entry. Rigid inspection has reduced the persons undertaking to ship into the United States by 50 per cent in less than a year and a half. As a result, only sweet milk and cream meeting the strict requirements of the law, coming from inspected establishments, is a factor. Discussing this situation a statement by the Department of Agriculture includes the following comment:

> Cancellations of dairymen's permits were due to failure to properly identify shipments with tags, offering for entry milk or cream higher in temperature than 50° F., shipping milk that exceeded the permitted bacteria standards, and failure of dairies to pass inspection of field veterinarians. Permits of pasteurization plants have been cancelled for the receiving of milk or cream from unapproved sources, failure to properly pasteurize or to keep accurate pasteurization records, using contaminated water at plant, and failure to maintain the sanitary conditions of the plant or equipment. The improvement in dairy farms and pasteurizing plants in Canada has been revolutionary. On the farms, milk-houses are now up-to-date, utensils are sanitary, stables are whitewashed, barns are well ventilated and well lighted, and sanitary conditions in barnyards are generally better. Pasteurization plants have been rebuilt and remodeled and now turn out products of low bacterial count.

We wonder whether large American milk-products plants are exercising care in supervision of the sources of supply of their raw material equal to that indicated for these Canadian shipments.

Converting a Complex Substance

INTO SIMPLER AND

More Valuable Foods

Milling, Washing, Filtering, Drying, Pressing, Heating, and Hydrolyzing Are Basis of Corn Products Industry

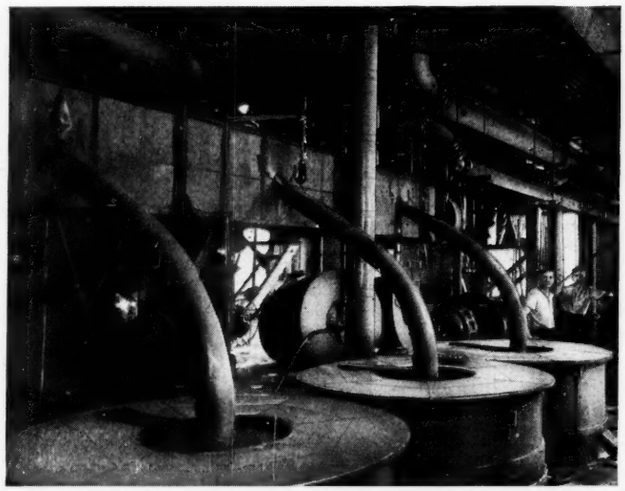
By A. P. BRYANT
Clinton Corn Syrup Refining Company
Clinton, Iowa

ONE OF THE COMMONEST and most widely distributed natural compounds is starch—the food stored up by nature for the growth of the plant seed. In consequence it is an important constituent of nearly all food materials of vegetable origin, forming the greatest single source of heat and energy in our daily diet. But starch is of value not only as a food but also in a great variety of technical processes. This is particularly true of the textile industry, where immense quantities are used in sizing.

Starch is, of course, a pure chemical compound, a carbohydrate having the formula $(C_6H_{10}O_5)_x$ so we know all about it; that is, providing we know the value of X, which unfortunately we do not. If we did we would know a great deal more about starch than we do at the present time. A man once remarked: "I have been studying starch for 25 years and know less about it today than I thought I did 25 years ago."

Just as there are many kinds of dogs—collies, bulls, Great Danes, terriers, and the like—each with different characteristics, so are there different kinds of starch, such as wheat, corn, potato, cassava, and others, each with its peculiar characteristics and with different shaped cells or granules, and just as we cannot explain why one breed of dogs differs from another breed so we cannot explain why $(C_6H_{10}O_5)_x$ from the wheat grain should differ from that derived from Indian corn or both of them from that obtained from the cassava root. Like all complex chemical compounds, starch can be split up into a variety of modifications and hydrolytic products. If the suffix "X" in the formula is changed to "Y," whatever that means, we have a different behaving starch known as modified starch. If the suffix becomes "Z" we have something different again until finally we reach the dextrins where brave souls endeavor to give a definite value to the suffix, as, for example, $(C_6H_{10}O_5)_{32}$.

Following the changes in the starch molecule that do not affect the relative proportions of carbon, hydrogen, and oxygen, come the hydrolytic changes which take place by the addition of more hydrogen and oxygen in the proportion of H_2O. Thus we have maltose, $C_{12}H_{22}O_{11}$, or dextrose, $C_6H_{12}O_6$. From these sugars can be obtained organic acids and alcohol.



Mills grinding the corn and, in the background, the so-called crackers used for breaking up and degerminating the corn

Still another line of cleavage of the starch molecule can be brought about by the action of certain micro-organisms or enzymes, with the production of various final products, of which butyl alcohol is a good example. Starch, therefore, plays an important part in the preparations of lacquers of the Duco type.

In the early days of the starch industry the potato was a common source of raw supply but many years ago Indian corn—*Zea mays*—supplanted the potato as the most important source of starch both for food and industrial purposes, and it is to cornstarch that we will turn our attention.

There is an annual requirement of something like 85,000,000 bushels of corn by the corn sirup and cornstarch industry in the United States, and the majority of the plants devoted to the manufacture of these products are located in the Central West adjacent to the greatest source of supply of the raw material—corn. The annual production of cornstarch, corn sugar, and corn sirup (unmixed) is in round numbers about 1,000,000,000 pounds each.

Milling Operations—The general process used in the production of cornstarch and its hydrolytic products is

too well known to require more than the briefest outline. The dried, shelled corn is soaked in water until the various portions of the kernel, namely, the germ or embryo, the hull, the gluten, and the starch, can be readily separated from one another. The process is under continuous control through the chemical laboratory in order that all operations may be efficiently carried out as to completeness of separation, avoidance of losses, and purity of each finished product.

Starch, of course, is the chief product of these operations, but because of its relatively high price the oil of the corn likewise is a very important item. This oil is expressed from the germ. The hull, the gluten, the germ residue after the oil has been expressed, and the concentrated water in which the corn is soaked, which contains noticeable quantities of soluble solids extracted from the corn, are mixed in different combinations and sold as concentrated cattle feeds. By virtue of their high digestibility these feeds are of great value.

Purity of the Starch—It is highly essential that the starch be freed as completely as possible from all other constituents of the corn kernel, which in so far as the starch is concerned are impurities. This means that there must be left in the starch no residual fibrous matter from the hull, no oil, no mineral matter, and not more than the faintest trace of gluten. It is noteworthy that today the cornstarch of commerce is one of the purest of chemical compounds, obtainable in almost unlimited quantities and at a very moderate price.

In attaining this result the starch, after the removal of the gluten on starch tables, is washed and rewashed, passed through silk bolting cloth again and again and is finally ready to be made into some form of dry starch or to be hydrolyzed into corn sirup or corn sugar. In the latter case it is unnecessary to dry the starch. In the former case it must be dewatered, usually by means of continuous filters, and then dried in kilns by hot air or in large vacuum driers.

Starch and its products may be divided into five classes: thick boiling starch, thin boiling or modified starch, so-called gums, dextrins, and hydrolytic products from starch.

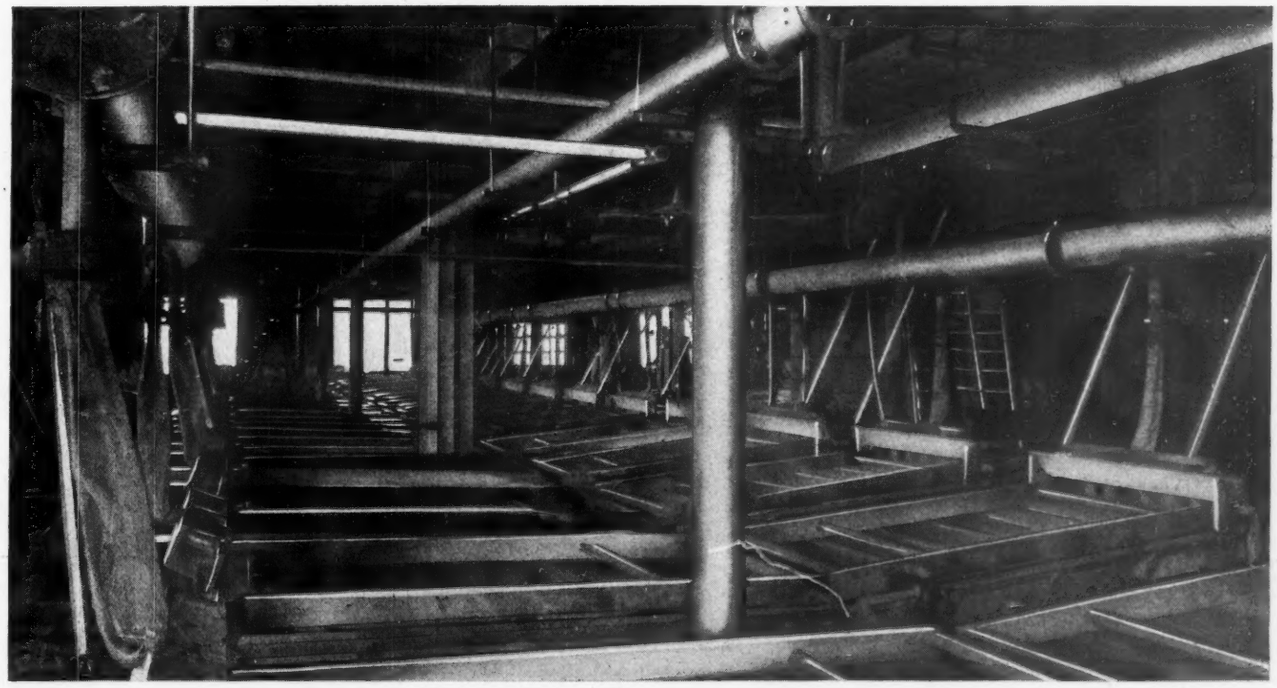
Thick Boiling Starch—When starch is dried in kilns or vacuum driers it contains a relatively large percentage of fine, almost powdered, starch and also little lumps which give it the name commonly applied, "pearl" starch. This is the form in which it is most used in industrial work, such as sizing in the textile industry. If this same starch is powdered so as to pass a 200-mesh sieve it is the so-called powdered starch of commerce and it is in this form that it is largely used in food preparations; the cornstarch used in the home, for example. The only difference between pearl and powdered starch is its mechanical consistency, although it is not always necessary to have as pure a starch for technical processes. For this reason the powdered starch will always be highly purified, but the pearl starch, although usually highly purified, may not have received the thorough treatment that would be accorded to starch which is to be made into the powdered form.

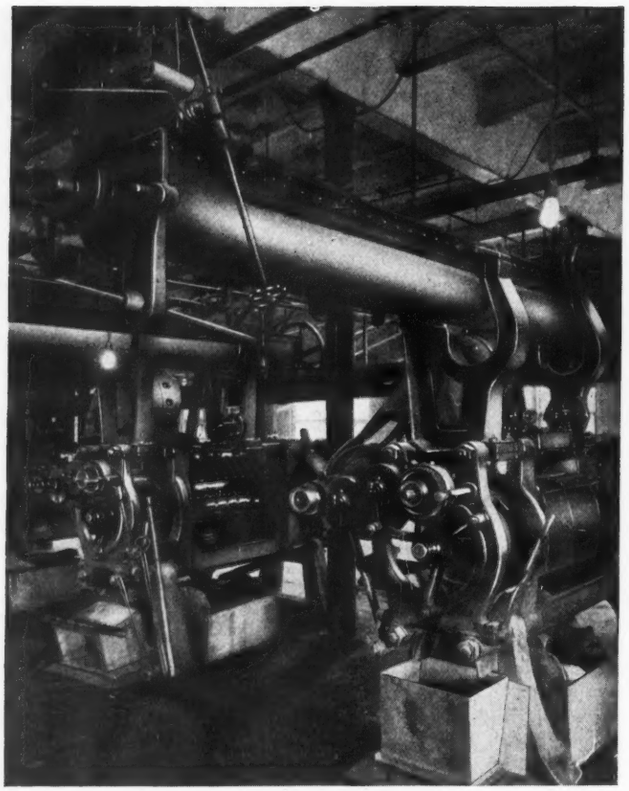
Lump or gloss starch used in the household laundry is ordinary starch which has been heated somewhat and placed under immense pressure until the starch sticks together and when cured and broken into fragments appears on the market as lump or gloss starch. It also is sometimes made by very slow drying of cubes of starch and breaking these into lumps of the desired size.

Candy manufacturers require a starch which will take and hold an impression, to the end that different kinds of candy, such as gum work, cream centers, cream bonbons, marshmallows, and the like, may be cast while semi-liquid and retain the form of the impression. This starch is made by impregnating powdered starch with an infinitesimal quantity of oil and is called molding starch.

Soluble starch, so called, is thick boiling starch which has been treated with chemicals in such a way as to disintegrate the cell wall and permit the starch to

Shakers covered with silk bolting cloth used in purifying the starch from residual matter other than gluten





Expellers used for removing oil from the germ

"dissolve," that is, form a paste with cold water. The output of such starch is relatively small.

Thin Boiling or Modified Starches—When a slightly acidified starch milk is allowed to stand for some time at a temperature not far below that of incipient gelatinization the characteristics of the starch are changed and when boiled in water it forms a much thinner paste than do the thick boiling starches under the same conditions. The degree of modification depends upon the acidification, time, and temperature, and usually is measured by the number of cubic centimeters of a 5-per cent solution made with 1-per cent caustic soda in water that will pass through a funnel tip or fluidity apparatus in the same length of time as is required for the delivery of 100 cubic centimeters of water. Thus a modified starch may have a fluidity of 40°, which means that 40 cubic centimeters of the 5-per cent starch solution is delivered in the same length of time as would be required for 100 cubic centimeters of water.

The test is an arbitrary one and involves close control of all conditions. Modified starches are used for many purposes. Outstanding examples are found in the manufacture of orange slices and other gum work by the confectioner, where it forms from 10 to 12 per cent of the whole candy, and in the textile industry where a starch size is desired which will penetrate the cloth more easily.

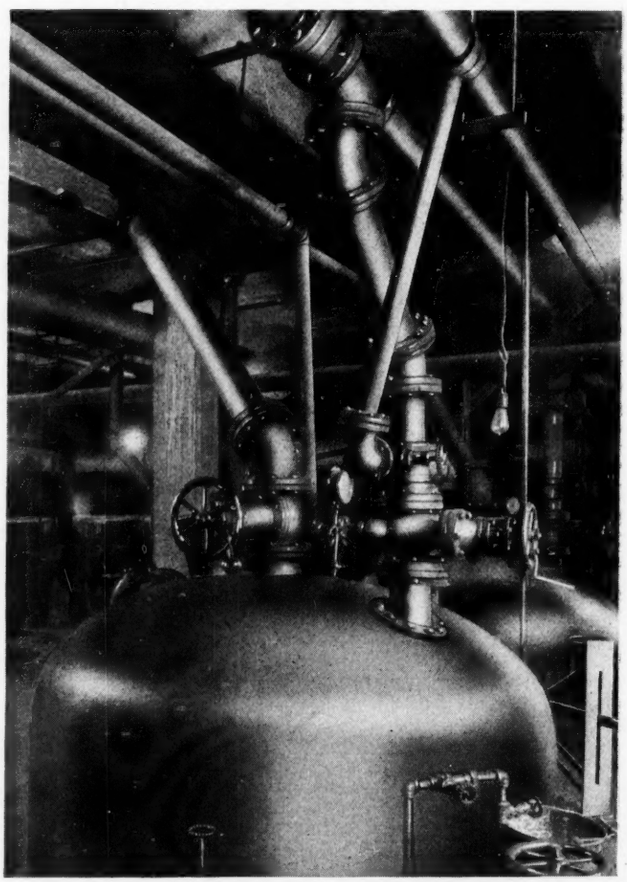
So-Called Gums—Another line of starch products is formed by chlorinating the starch in such a way as to give a very high modification or fluidity, appearing on the market under the term "gum." It is not really a gum but is a very highly modified starch with some gumlike characteristics.

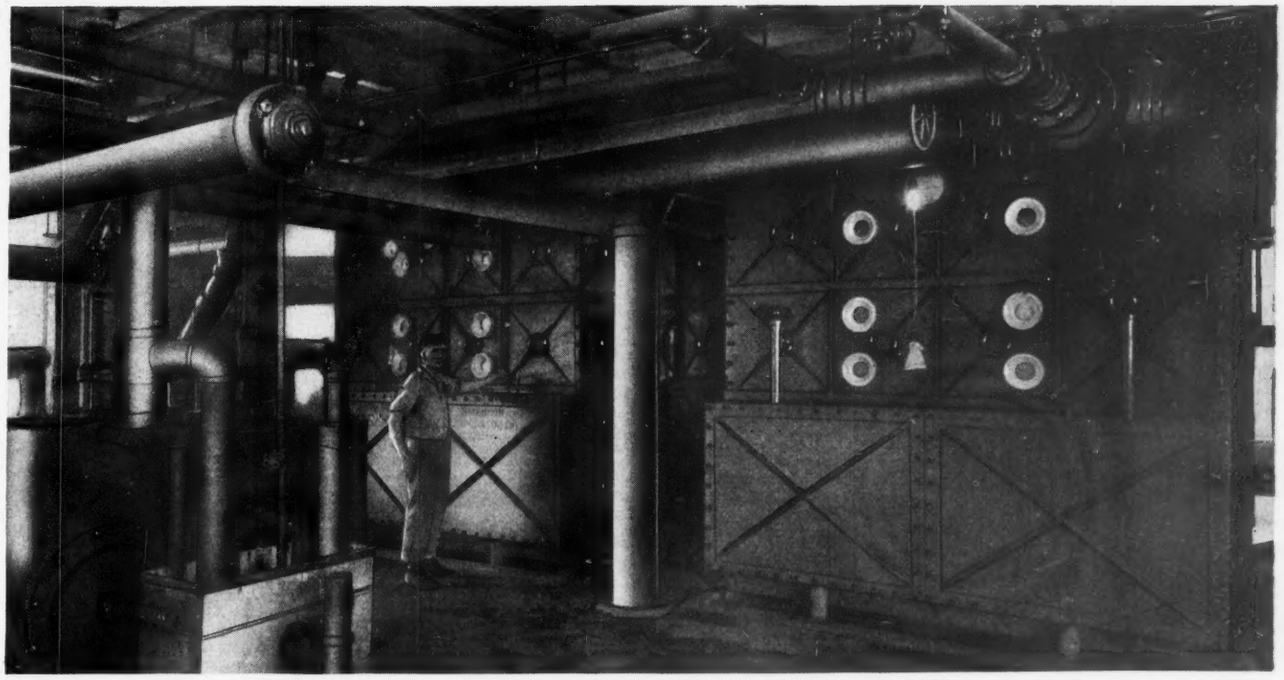
Dextrins—When dry starch, either slightly acidified or not, is subjected to continuous heat for some time it breaks down to a point where it no longer gives a blue color with iodine, nor does it act like starch when boiled in water. Depending upon the extent of the treatment, it is partially or entirely soluble in water and finds large use in the preparation of mucilages, in sizing materials, and many other ways. Here, again, very careful control of all conditions is necessary in order to give the exact uniformity demanded by the consumer for the different kinds of dextrins. When examined under the microscope, these dextrins still show the individual granules, although they are much distorted and broken.

Hydrolytic Products of Starch: Corn Sirup and Corn Sugar—When a mixture of starch and water (starch milk) is subjected to the action of acid, time, and heat the complex starch molecule is broken down, with the formation of reducing sugars and more or less complex dextrins. An increase of either factor permits reduction in one or both of the others. As it is desirable to maintain the acidity and time at as low a value as possible it becomes necessary to increase the third factor, temperature, which is done by cooking under pressure.

In the commercial production of corn sirup there is added to the starch milk sufficient hydrochloric acid to give about 0.07 per cent HCl in the mixture, the conversion process being carried on in large copper, bronze, or glass-lined converters under pressure sufficient to raise the temperature to about 285° F. The charge is cooked until a color test with iodine made on samples drawn from the converter indicates that the desired proportion of reducing sugars is obtained, whereupon the pressure is released and the charge is blown into tubs, where the trace of hydrochloric acid is exactly neutralized. Exact neutrality is determined by the pH at which the sirup is exactly iso-electric and factory control

Top of two converters where the hydrolytic change from starch to sirup or sugar takes place; filter presses in the background





A double-effect vacuum pan

can be maintained by either pH determination or acidity tests with some indicator which will give practically the same information, or by both ways. The degree of conversions is checked in the laboratory.

When the crude corn sirup is at the iso-electric point the suspensoids are thrown out and can be removed by filtration. The material thus removed is largely nitrogenous, consisting of small quantities of gluten of the corn which still remained in the starch. Final purification of the sirup is effected by the use of bone black (animal charcoal) or by activated vegetable carbons, or by both. The light sirup is concentrated in vacuum pans to the desired gravity, 42°, 43°, 44° or 45° Bé., referred to temperature of 100° F.

The foregoing description applies to the treatment of starch for the manufacture of corn sirup, but the same treatment applies in the production of corn sugar, although the quantity of acid used and the time required for the completion of the hydrolysis is greater, because this hydrolysis is carried much further.

Where corn sirup is to be made, the hydrolysis is stopped when from 40 to 45 per cent of the starch has been changed to reducing sugars figured as dextrose, although it is not uncommon to find corn sirups for special purposes running as high as 50 to 55 per cent dextrose and as low as 30 to 35 per cent. Corn sugar conversions, on the other hand, are carried to a point where 85 to 90 or even 92 per cent of the starch has been changed to dextrins.

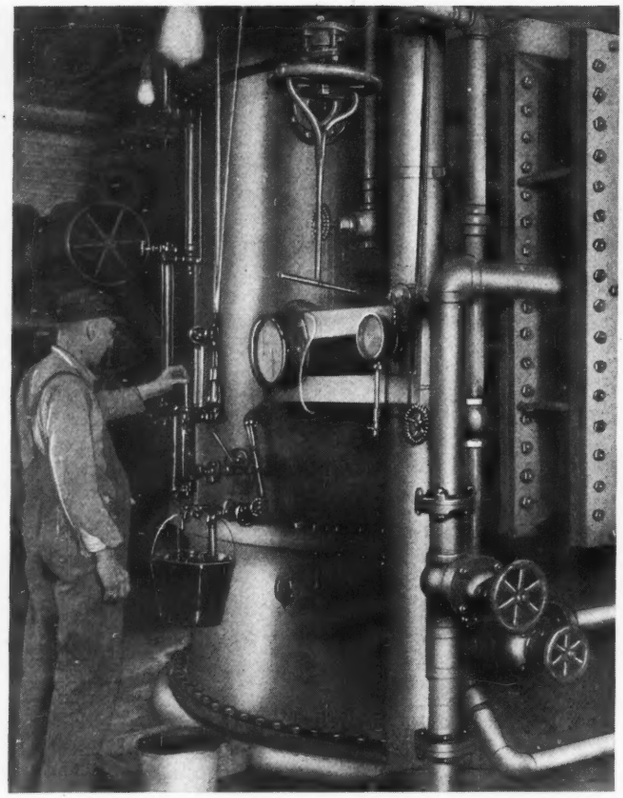
Corn sugar is found on the market in the crude form, such as so-called 70 to 80 corn sugar (70 and 80 per cent dextrose) and as refined corn sugar. The latter product is practically chemically pure dextrose and bears the same relation to crude corn sugar that refined cane sugar does, for example, to Cuban raw sugar, and the various steps in the purifying processes are quite similar although requiring more time.

Dextrose is somewhat temperamental in its crystallizing behavior. Under some conditions it appears in the form of hydrous crystals containing one molecule of water of crystallization. Under other conditions it crystallizes in the anhydrous form. With care the crystals of either sort may be obtained of such size and uniformity as to permit easy removal of the molasses, or hydrol, as it is more often called, by means of centrifugal machines; but if conditions, concentrations, and temperature are not kept exactly right the sugar may crystallize in such small crystals as to make it exceedingly difficult to purge these in the centrifugals. The hydrol so obtained may be made into crude sugar again or used as a molasses somewhat similar to blackstrap molasses or beet molasses.

At first it might be supposed that the analysis of corn sirup and crude corn sugar would be a comparatively simple task, but this is not true. It is fairly certain that corn sirup contains maltose as well as dextrose and if we were certain that the non-reducing organic matter had a uniform composition, or at least a uniform specific rotary power, it would be easy to determine the relative proportions of dextrose and maltose. Unfortunately, there is but little doubt that there are traces of other reducing substances besides dextrose and maltose and that there are compounds present of unknown optical rotating power. For this reason it is customary to figure all reducing sugars as dextrose and the non-reducing organic matter as "dextrins by difference."

Also, the determination of total solids or dry substance is not simple and the same analyst will frequently find it difficult to obtain duplicate or triplicate results which will agree. For this reason corn sirup is sold on a gravity basis, namely, the degree Baumé at 100° F., referring to water at 60° F. The Baumé standard is not the American but the old Dutch sirup standard based on the modulus 144 instead of 145. Thus the specific gravity equals $\frac{144}{144 - \text{Baumé}}$.

Corn sugar probably contains no maltose but the non-reducing organic matter is not all dextrins, consisting rather to a considerable extent of so-called "reversion products," so that here again it is customary to admit lack of exact knowledge and report "dextrins by difference," knowing that what is really meant is undeter-



A finishing vacuum pan

mined matter by difference. The approximate percentage composition of average corn sirup, "70" corn sugar and refined corn sugar is shown in the following table:

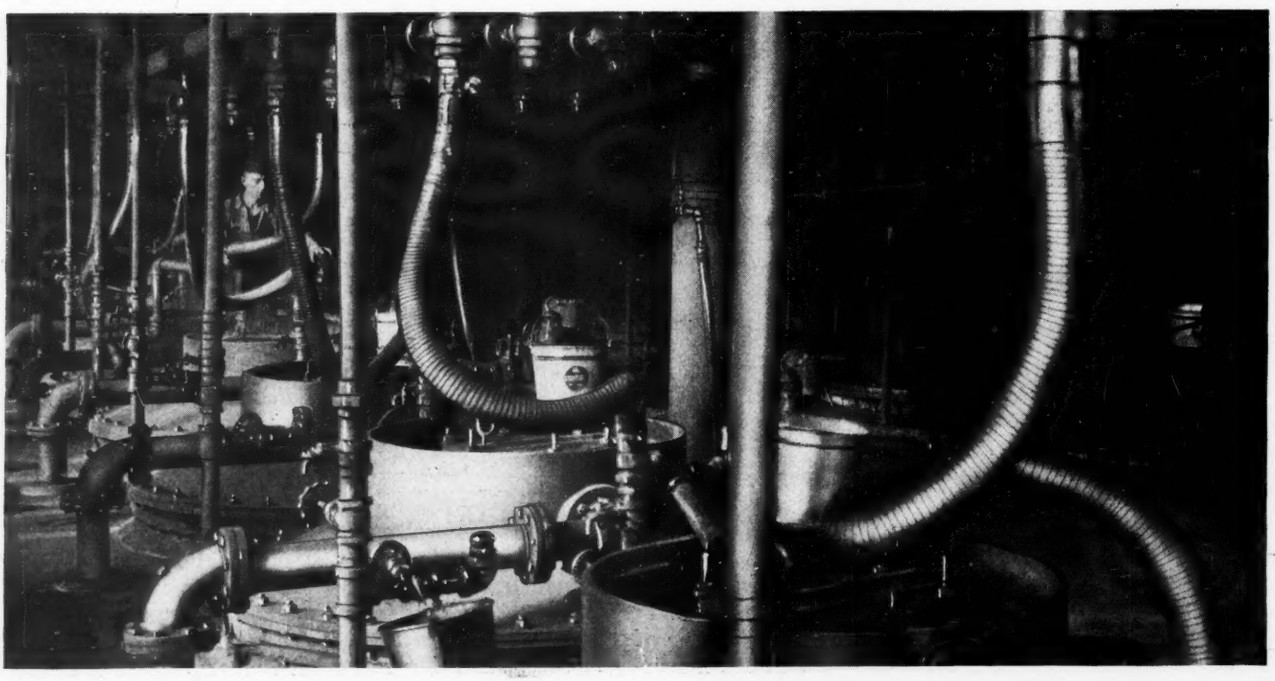
	Corn Sirup 42° Baumé	Corn Sirup 43° Baumé	"70" Corn Sugar	Refined Corn Sugar
Water	19.5	17.7	19.0	8.0
Protein	Trace	Trace	Trace	0
Ash	0.3	0.3	0.9	Trace
Reducing sugars as dextrose	34.6	35.4	70.9	91.3
Dextrins by difference	45.6	46.6	9.2	0.7

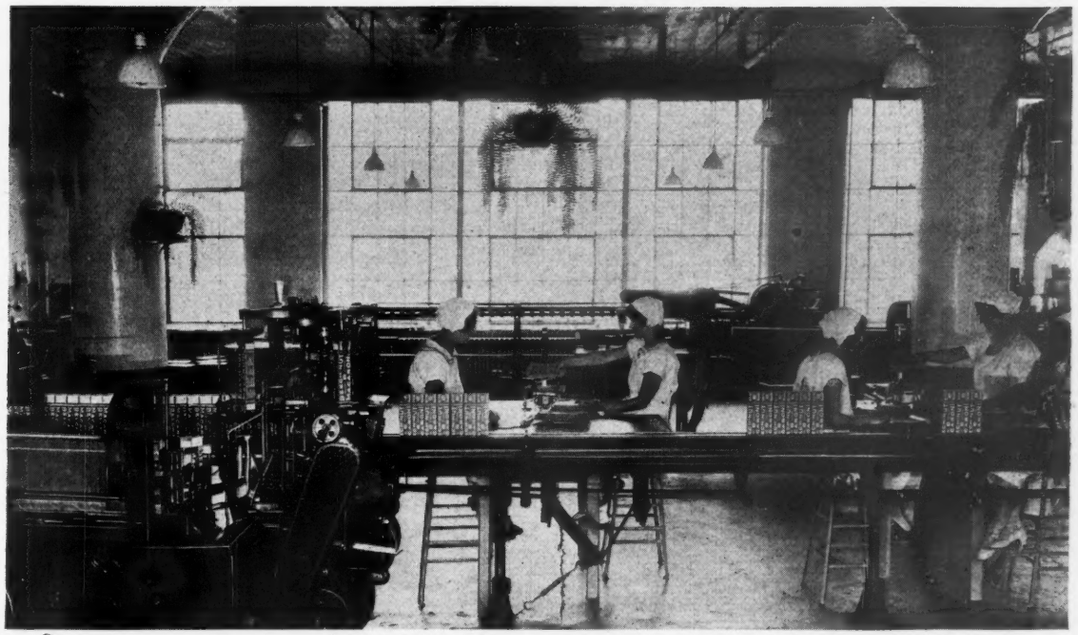
Corn Oil—In the opening paragraphs of this article reference was made to the corn oil derived from the embryo, or germ, of the corn. When refined this oil makes an excellent edible oil that is fast coming into high repute. The supply is limited by the demand for starch, sirup, and sugar because it is one of the accessory or incidental products obtained in the manufacture of these latter although the more valuable pound for pound. A bushel of old corn will yield on the average about 1½ pounds of edible or refined oil.

The refining process is quite similar to that used in the refining of cottonseed oil, described so ably in FOOD INDUSTRIES for last September, but some of the refining steps are a little more difficult to carry out than in the case of other vegetable oils.

Watching the Leaks—Because of the large volume of water used and a slight solubility of the corn and the possible entrainment losses at vacuum pans, the possibilities for loss are great and entail much control work and ingenuity in avoiding such losses. This subject is too complicated to be discussed briefly. Suffice it to say that every outlet must be watched, not only to determine existing losses but to bring these to the irreducible minimum. Such control work is indeed scattered throughout the process, as it is very essential to know not only that there is no matter lost in entirety but that separations at different stages of the process are as complete as possible. For example, an unsatisfactory recovery of oil from the germ involves no loss of dry matter but means that the more valuable product goes out at a lower price per pound in the corn oil cake meal. Again, a poor separation of starch means an increase of starch in the feed and a decreased yield of finished starch, sirup, or sugar carrying a higher price per pound than feed. Such control, of course, necessarily calls for complete and well-manned testing laboratories. Not only does the laboratory control comprise watching the process but careful standardization and examination of the finished products in order to maintain the quality and uniformity in these which is so essential.

Shows top of tall filters filled with bone black for purification of the sirupy liquors





Weighing, filling and packing Beechnut macaroni. Plants like this are easy to keep clean

How WHITE PAINT *Is Used*

By Food Manufacturers

By L. H. TROTT
Assistant Manager Technical Service
The New Jersey Zinc Co.

ALMOST promising feature of American industrial progress is the realization that cleanliness is essential. Instead of the slovenly shop conditions that mass production might produce, one finds that modern methods of manufacture and quantity production call for a clean plant and cheerful surroundings. Also, it is generally recognized that improved quality as well as an increase in the quantity of the manufactured article ensues naturally as a result of improved working conditions.

Ten years ago this reasoning was not as widespread as it is today. But in the food industry cleanliness always has been a productive factor. And white—on painted walls and in workers' garments—has been the symbol of this cleanliness.

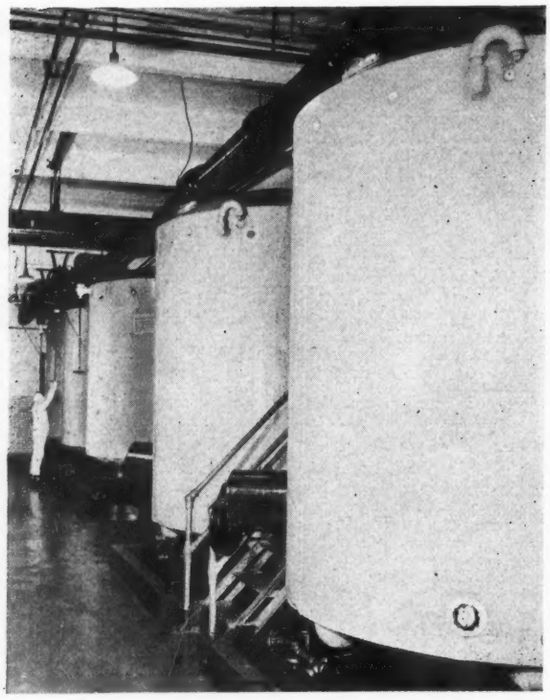
This is not by any means remarkable. "White for purity" has echoed symbolically down the years since knighthood's day. Naturally, there is no industry more scrupulous about purity, and the cleanliness that achieves it, than the food industry.

H. C. Achorn, vice-president of the New England Confectionery Company, thus sums up the attitude of his firm, which has recently completed one of the most modern plants, regardless of industry, in the United States: "One of the positive fundamentals of the factory policy of the New England Confectionery Company is to have every building, every machine, every piece of equipment scrupulously clean."

White paint upholds this policy. On the top floor, where the chocolate coatings are prepared; on all lower floors, where hard candies, soft candies, chocolate-coated and uncoated candies are mixed and molded, everywhere throughout the plant flat white paint is used on walls and ceilings. Even in the storage room, and power plant, the shipping platform, here again white paint predominates.

The H. J. Heinz Company at Pittsburgh; the Beech-Nut Packing Company at Canajoharie, N. Y.; the National Biscuit Company at Pittsburgh, and the Abbott's Dairies, Inc., of Philadelphia—all plants that I have inspected—are painted white throughout the interiors. A safe estimate is that nineteen of every twenty food industries plants are painted white. Cleanliness, illumination, sanitation, and advertising form the sound basis for this policy.

Of the foregoing, the last named is by no means least



These glass-lined aging tanks in Abbott's dairy in Philadelphia are a striking group painted white

in importance. It may be a bit far fetched to say that a housewife is proud of your products after she has seen the plant, but she certainly is proud of the fact that she can tell her guests, even her own household, about the preparation of the foods she buys. Walls, floors, machinery, employees' garments, hand and machine methods, receive her closest scrutiny. For these reasons white paint and the impression of immaculate cleanliness it creates serves better than any other advertising medium to emphasize the spotless kitchen which stands so high in her admiration.

Of interest here is the machine shop of the Beech-Nut Packing Company at the Canajoharie plant. It stands in one of the most conspicuous portions of the building, is glass inclosed, and walls, ceilings, and machinery are painted white throughout. The machinist is in white overalls. This white shop, an oddity elsewhere, appears entirely appropriate in surroundings which harmonize.

Clean Walls and Ceilings—Paint color is not only responsible for an appearance of cleanliness but also for the upkeep of that appearance. Every effort is made to keep a white wall clean simply because it is white. Dirt leads to washing or repainting because of its easy visibility against the white background.

The surface of the white paint used is an important factor in combating dirt. Glossy surfaces, with no protruding particles to which dirt can cling, become dirty very slowly. They also are very easily washed, because of this same surface, when they become dirty. The H. J. Heinz Company uses both glossy and flat white paint. It is the company's custom to repaint thoroughly at least once a year, washing the paint work twice within that time. In the spaghetti-manufacturing department, perhaps the most striking showplace in the plant, a glossy white paint is used on walls, ceilings, and machinery. Other than a low, 12-inch dado of black, which serves for contrast, everything is spotlessly white; even the uniforms of the workmen who tend the dough mixers, the spaghetti presses, and the dryers. The spaghetti itself is no whiter than this immaculate room.

The same applies to the macaroni plant of Beech-Nut at Canajoharie. This entire plant is done in glossy white. Here is another showplace of the company and of the industry.

It might be well to mention that spaghetti and macaroni plants, because of the process of manufacture, which necessitates a humid atmosphere, are receptive to fungi and bacteria. The Foulds Milling Company overcomes any likelihood of creating this condition by repainting very frequently. Others repaint at the end of each six months, washing the walls and ceiling once or twice meanwhile.

Dr. Henry Gardner, chief of research for the paint manufacturers' association, has spent considerable time on the subject of disinfectants in paint, suggested for germicidal use. He states that they are unsatisfactory for the twofold reason that fungus growth is entirely a surface attachment and does not come through the paint, and that when paint deteriorates the insecticide may be blown among the employees, possibly contaminating any foodstuffs with which it may come in contact.

A zinc oxide-lithopone base enamel is used successfully by many who are troubled by bacterial contamination. A paint so compounded may be washed down frequently with neutral soap, water, and a hand brush; or, as in the case stated above, the surface may be repainted from time to time.

The use of glossy white is not universal. In fact, flat white is used perhaps to a greater extent than gloss, and in some cases rightly so. The New England Confectionery Company uses a flat white paint throughout the plant, with the exception of the dado. This is darker but in most cases is merely a tint made from the same white base paint. Stephen A. Whitman Company uses a flat white, to the practical exclusion of the glossy white. Abbott's Dairies and H. J. Heinz use both.

The importance small items of cleanliness receive in the modern food factory is illustrated by two examples from the National Biscuit Company's Pittsburgh plant. Formerly permanent signs of the bulletin-board type, giving warning of fire exits, electrical switches, and the like, were firmly nailed or screwed to the walls. Today they hang on hooks, to the end that the wall behind the signs may be regularly painted and thereby free it of bacteria, dirt and other undesirables. Also, in the bread-baking department the ceiling directly above the dough mixers is painted black. This is done to insure cleanliness, as any small particles of dough which spatter above the machines are easily detected by virtue of the vivid contrast of white against black, and practically demand washing.

Good flat paints may be washed as easily as glossy surfaces. The extremely minute size of the particle of the zinc pigment used in both types of interior paints helps to eliminate any extremely wide variation in surfaces. Flat paints also have the advantage of greater resistance to yellowing. Certain gases, such as a strong hydrogen sulphide, sulphur dioxide, and ammonia, are ruinous to any paint except those especially compounded to resist these fumes. Neither zinc oxide nor lithopone is discolored by them. As most flat interior paints contain a greater quantity of these pigments, and less of the vehicle, which is susceptible to attack, their resistance is relatively great.

This is particularly applicable to rooms which are re-

frigerated with an ammonia refrigeration system. Where the temperatures go very much below freezing, they are seldom painted. But in the moderate temperature refrigerators, 45 deg. to 70 deg. F., a good-quality flat zinc pigment base paint will be very serviceable.

Illumination—Common sense and elaborate photometric tests both substantiate the claim that illumination has a definite bearing upon production and the disposition of the workman. Both machine operators and hand operators are quicker, surer, and cheerier at their work; spoilage is diminished; labor turnover is diminished, certainly and notably where wages are earned in attractive plants.

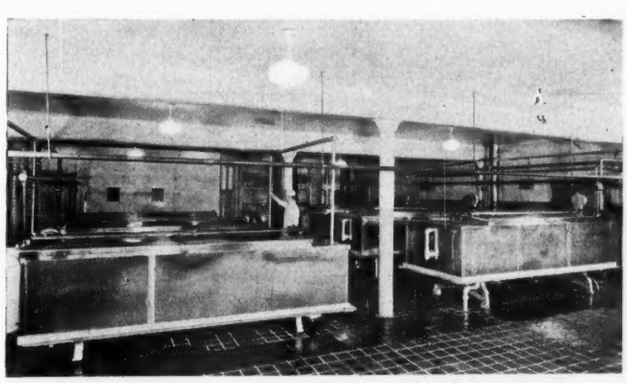
Three factors govern illumination: a natural light, artificial light, and reflection of light. There are many cases where nothing more elaborate than proper painting with a white or light tinted paint has transformed a dark plant to a relatively well-lighted plant at a cost which is but a fraction of the increased return.

A block of magnesium carbonate, an extremely white material reflecting 98 per cent white light, is generally accepted as the standard for whiteness with which other surfaces are compared. Based on this standard, the reflecting values of industrial interior colors are as follows:

Color	Per Cent of Light Reflected	Color	Per Cent of Light Reflected
White (new) ...	82—89	Blue (Light) ...	34—61
White (old)	75—85	Pink	36—61
Cream	62—80	Gray	17—63
Ivory	73—78	Tan (Dark)	30—56
Green (Light) ..	48—75	Red (Dark)	13—30
Yellow	61—75	Green (Dark) ..	11—25
Buff	49—66		

Being habituated to the use of white paint as a factor in cleanliness, food industry engineers have had the best light reflector virtually "thrust upon" them, in the same manner that "some are born neat," "some achieve neatness," and "some have neatness thrust upon them."

Buildings in the food industry are practically all of the multiple-story type, from two to six stories, with a moderate distance between floor and ceiling. For most

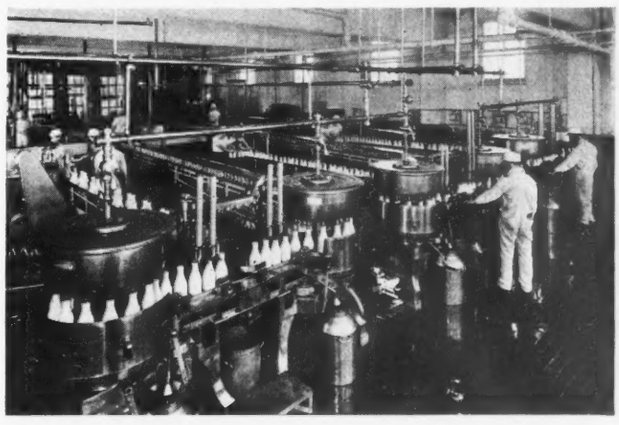


A combination of white walls and ceilings, and corrosion-resistant alloys at Abbott's

food processing it seems to be the logical style of construction to reflect properly the illumination which enters through the windows, white paint should be, and is used. Skylights are of value, but only to the top floor.

The New England Confectionery Company plant serves as an excellent example of what is being done today to meet the requirements of good illumination. Years of planning went into its construction. The dado, which extends to a height of five feet, is for the most part green or black. All walls and ceilings are white. Galleries and low ceilings shut off a great deal of the daylight admitted, even though the maximum amount of wall space is devoted to windows. The floor area is so great that the central sections would be very dark unless ceilings, pillars, and walls of white reflected every possible bit of illumination. With the exception of special rooms where heat and humidity must be controlled, there are no partitions between sections, to make a break in the continuous flow of light.

In the Pittsburgh plant of the National Biscuit Company the baking room is extremely well lighted. Occupy-



The large bottling room at Abbott's dairies in Philadelphia is well illuminated by daylight diffused from properly painted walls and ceilings

ing the top section of the building, it is lighted by windows on one side and by sidewall skylights on two sides. The other wall and the ceiling have no windows but, like all other portions of the room, are painted a glossy white. Diffusion of light is perfect, every corner being as light as the center of the room. Sunlight, flooding in through the windows, is well diffused and reflected by the white walls. Here is a unit where position, style of construction, lighting, and painting are combined properly to produce a harmonious and pleasant whole. The atmosphere is cheery as is the mental attitude of the bakers, and production is at a correspondingly high rate of speed.

Often this type of building is built around a court, perhaps with one side open. If all exterior walls on such courts are made of a light stone or painted white, thereby augmenting their power of reflection, interior lighting is improved substantially. According to research conducted by the Detroit Steel Products Company, in conjunction with the University of Michigan, the increase in reflection so effected has been known to approximate 35 per cent. This is an extremely simple method of increasing light efficiency that is all too often overlooked.

Illumination Value of Flat and Glossy Paints—In considering the question of glossy versus flat paint, it should be borne in mind that a flat finish is obtained by using a relatively large quantity of pigment, whereas a glossy paint is compounded with less pigment and more of the carrying vehicles, such as oil, varnish and other nonpigment constituents. Light reflected from flat paint is diffused because of the microscopic irregularity of the surface. Glossy paint, with its smooth surface, acts as a mirror, reflecting the light without the diffusion characteristic of flat paint. In other words, it is contended that glossy paints produce glare. On the other hand, it is claimed by some that in plant interiors the slightly better illuminating value of flat white as compared with

glossy is counterbalanced by the superior washability of the latter. Either type of paint, so long as white or a light tint is used, serves as an excellent reflector. Personal opinion, which is fairly equally divided between the two, based on tests, usually decides the type of paint to be used.

In a recent trip plants were visited during days in which the light was very bright, and in no case was glare from glossy paints a disagreeable feature. In fact, it would seem a safe generalization that the average workman or plant visitor would seldom be conscious of glare from white paints.

Protection—Paint applied with a fair amount of intelligence and common sense is always protective. In view of the relatively great age of some food-making plants, it is with surprise that one realizes the excellent condition in which they are at present. Some of the buildings of the Heinz plant at Pittsburgh have seen well over a quarter century of service, but a force of from 15 to 18 painters protect the original investment by constantly refinishing the interior.

The milk bottling plant of the Abbott's Dairies in Philadelphia is an old and remodeled building. Yet the interior presents a very well preserved and modern appearance. Here too a continual round of painting insures protection.

Stephen A. Whitman & Company, the National Biscuit Company's Pittsburgh plant, and countless others all show that paint, properly applied and with the right frequency, is a building economy because of its remarkable preservative value, if for no other reason.

Fumes—Because of their relatively great number and varying characteristics, fumes encountered in food plants constitute a problem of considerable magnitude to the paint user. Nor does experimentation on the part of paint manufacturers always prove effective, for there is a very real difference, for example, between gas and coke fumes as such and the same fumes intermingled with the vaporous exhalation of fermented dough.

In consequence, many a bake room has been painted with special formula compounds of various fume-resistant materials, but, in the main, with more or less disappointing results. Future trouble along this line may be prevented, it is believed, by removing all old paint, applying a flat priming coat, and finishing with a good quality zinc oxide-lithopone base paint with a special fume-resistant vehicle.

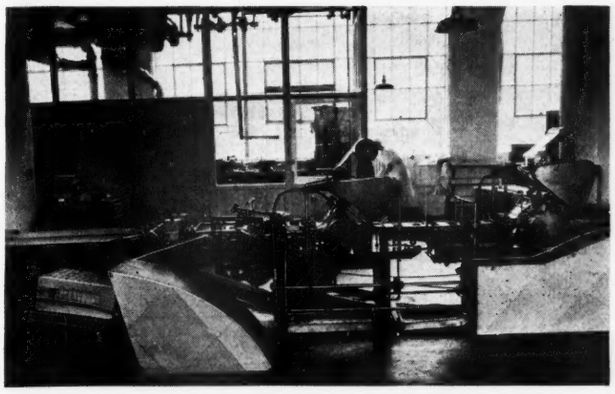
In so far as its deteriorating effect on paint is concerned steam may be classed with fumes. When it is allowed to rise to the ceiling and condense, it will bring about the cracking, blistering, and peeling of many walls and ceiling paints that would give good service under other conditions. The best solution is prevention, a good ventilating system being able to remove steam with sufficient rapidity to forestall condensation on the paint. Even with this precaution the paint should be of special preparation.

Painting Machinery—Color is not an important item in painting food-manufacturing machinery, except where good light is necessary. Although white predominates, it seems to serve mainly to carry out the white color scheme established with excellent taste by most food factories. Metallic gray, maroon, brown, olive gray, and black also are used. Machinery is washed very often and, of course, glossy paints are preferred.

Abbott's Dairies, Inc., has a company color scheme, used in all advertising and publicity, of cardinal and white. In their ice cream factory the power plant and refrigeration machinery are painted cardinal, the room itself being white. Using colors in this manner is well calculated to evoke a response in anyone familiar with their far-ranging trucks and wagons, which are white with lettering and trademark in red.

Pipe-Line Colors and Specifications—Throughout industry in general a serious effort is being made to standardize on pipe-line coloring. The U. S. Navy has been a pioneer in pipe-line painting for ease of identification, and many representative firms are painting with different colors the lines that carry hot water, cold water, low-pressure steam, high-pressure steam, intake water, ex-

This oven room of National Biscuit's Pittsburgh plant was photographed without the aid of flash or electric lights by ordinary daylight—a possibility through the use of high-light reflecting white paint



Wrapping fruit drops at Beechnut's plant. Even the machine shop in the rear is immaculate white

haust steam, condensed steam, oil, gas, and the like. Others simply band them with color at frequent intervals. In most cases the system serves well for identification, and pressure is being brought to bear on all industry to standardize on the colors used.

Among the plants visited, the Beech-Nut Packing Company is marking its lines, even those in the laboratories as is the H. J. Heinz Company. In all the plants of the National Biscuit Company the following standard color scheme is used:

Conduit lines, Green (Pale).
Fire sprinkler lines, Red.
Hot water lines, Green (Dark), 6-in. black stripe every 10 ft. on mixing line.
Cold water lines, Orange, 6-in. black stripe every 10 ft. on mixing line.
Waste water lines, Black.
High-pressure steam lines, White, cold water paint.
Low-pressure steam lines, Brown (Light).
Plumbing vent lines, Blue (Light).
Ammonia lines, Black, stenciled with white dots.
Brine lines, Gray (Light).
Air lines, Green (Dark), stenciled with white dots.

One of the largest of the steel producers, a locomotive manufacturer, various metal products and machinery manufacturers, coal mining companies, textile mills, and various process industries are known to be using color in comparable fashion, although in no case are the same colors used. However, in most cases the Navy specifications are approximated.

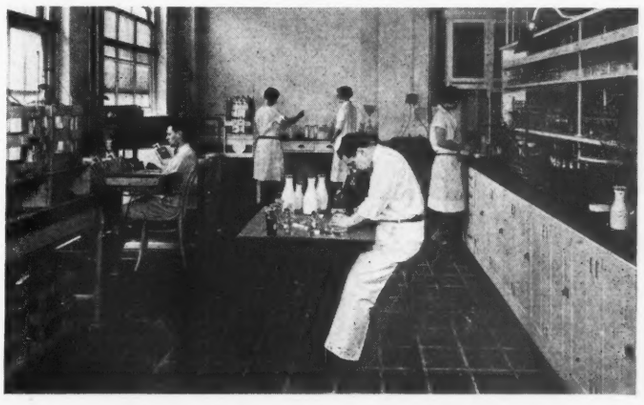
Examples of the influence of personality in painting may be of interest to food manufacturers. In a large steel mill, traditionally dirty, the new turbo blower room is a sight to rouse the envy of a modernistic interior decorator. Here are found light walls, colorful machinery, vari-colored pipe lines, vivid yellow staircases and handrails, and high above them all a lone traveling crane pea green in color, of the shade that may be found on many a piano. This chromatic symphony was found to be the achievement of the plant manager, who had personally suggested the color for the crane.

When the Harvard Graduate School of Business Administration was being built a few years ago, President Eliot attended all conferences concerning the color schemes to be used in painting. His suggestions were carried out, with the result that the new lecture rooms present a most restful set of interiors.

Method of Painting—Spray painting is economical wherever the surfaces to be painted are not so intricate as to demand an unusual amount of blocking out and similar preparatory moves. Because of the greatly lessened labor cost and the great saving of time in connection with spray painting, competition practically compels its use.

Of particular interest to food manufacturers is the statement of Dr. Starkloff, veteran Health Commissioner of St. Louis, to the effect that: "It has been found by actual bacteriological count that 75 per cent fewer disease organisms adhere to a painted wall where the paint has been forced into every crack and crevice by the spray method of painting than when painting is done in the ordinary way." This method of painting is particularly effective in hospitals, where frequent and regular painting has become part of the modern medical and surgical creed. This opinion would seem to apply equally well to the food industry. But brushing has by no means been replaced. In certain cases, where interiors must be painted while regular factory operations are in progress, brushing is indispensable. Obviously, care must be exercised to prevent the pigment-laden mist from permeating the atmosphere, to the discomfort of the employees and the possible serious contamination of the foodstuff being worked upon.

Plant Cafeterias—Speaking generally, plant cafeterias are painted white, or some very light color in the food industry, where practically all working interiors are white. Some effort has been expended in connection with specific tints used for relaxation. The cafeteria of Beech-Nut is in a mottled light green, exemplifying what would seem to be sound psychology. Workmen, or girls, employed in a white factory should spend all possible relaxation periods under non-factory conditions, and the company cafeteria can give an adequate change by its color scheme. Even though white creates a cheery atmosphere, any color, white included, is bound to be monotonous if unrelieved by harmonious tints. The kitchen of the cafeteria is, very properly, in white, as are all lavatories and change rooms.



The general laboratories of Abbott's dairies are painted with a zinc-oxide lithopone-base paint that stands up satisfactorily under the severe conditions of a laboratory

Delivery Trucks—White trucks on the street lead most people to think of a laundry or food products company. The white trucks with the green lettering and green pickles of H. J. Heinz are known throughout the nation. Beech-Nut trucks are white and Abbott's Dairies use a combination of white and cardinal. These trucks advertise white as the color of the industry. White paints and enamels used on trucks must be capable of withstanding every kind of exposure and temperature; furthermore, they must not darken or yellow, which is another way of saying that they must be able to resist the attacks of the ultra-violet rays of the sun.

AN ENGINEER

[THE SECOND OF TWO ARTICLES]

Looks at

Pressure Sterilization

By W. A. FLANNERY

Superintendent of Canning Department, Foods Division
Val Blatz Brewing Company
Milwaukee, Wis.

THE CONTINUOUS METHOD of sterilizing, or processing, canned foods offers what is probably the ideal method of mechanizing this operation. It is more completely adapted to automatic operation than are the modifications of retort processing that were discussed in the article in the November issue. Unloading cans from the cars and placing them in the can runways that carry them to the filler, then to the closing machine, then rolling them along on other can runways into the cooker and through that to the cooler, and out onto another runway that carries them to the labeler or to the storage space without the congestion of baskets and men is a continuous series of operations that appeals to any canner.

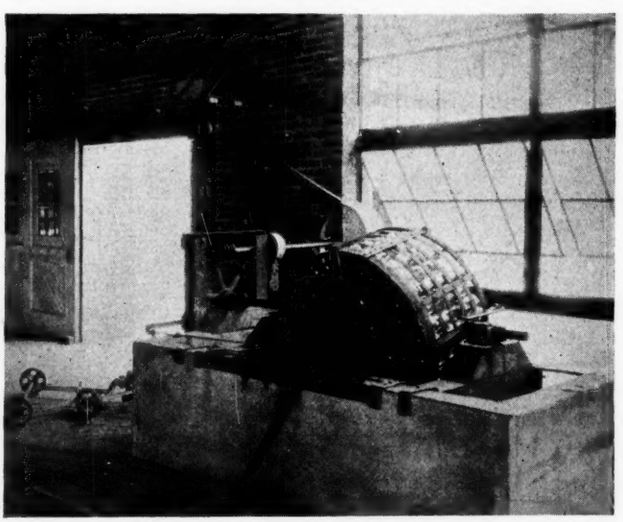
While the continuous cooker is fairly well known, particularly to many of the largest factors in the industry, it is desirable to bring out some of its salient features.

The cooker is a cylindrical shell placed in a horizontal position. Riveted to the inside of the shell is a helical can runway leading from the intake end to the discharge end. Revolving within the shell and just clearing the helical can runway is a reel having angle irons running its entire length. These angle irons are on the circumference of the reel and are spaced to hold the can when lying on its side, the height of the angle iron being somewhat less than one-half the diameter of the can. The helical can runway also has a depth of somewhat less than one-half the diameter of the can but will retain the ends of the can. In this manner a pocket is formed which locates each can in a definite position in relation to every other can from which it cannot change. As the reel revolves and the can follows the helical can runway it is free to slide along the angle iron of the reel and in this manner travels towards the discharge end of the cooker.

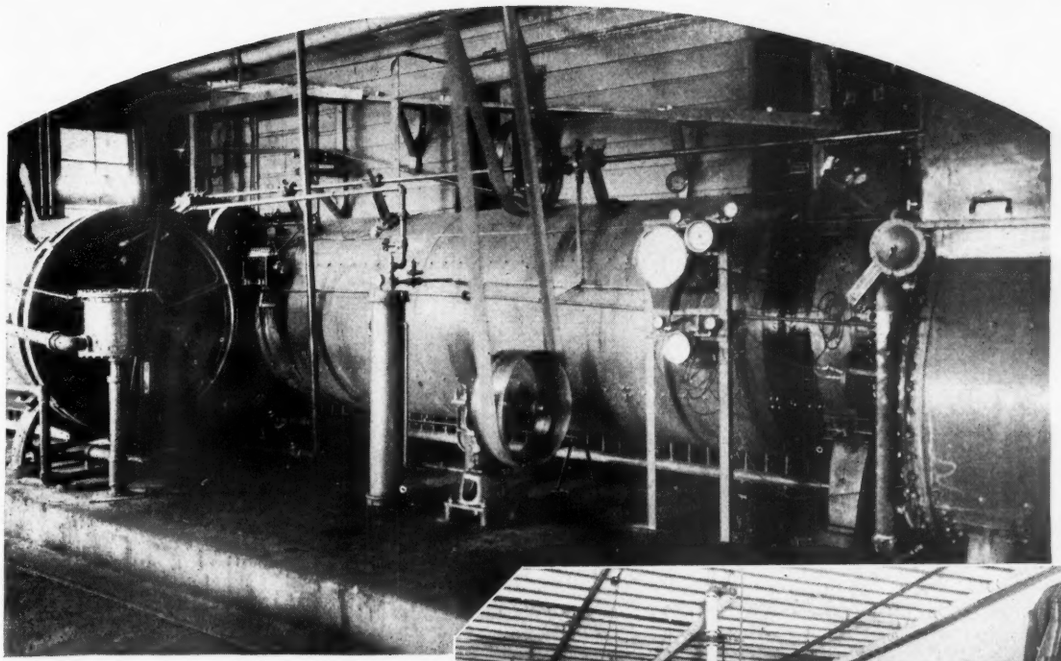
So far a description has been presented only of the can while passing through the cooker and up to the point of discharge, but as the intake and discharge valves are alike in operation a description of one will do for both. All are familiar with the revolving door in public buildings. In the case of the door one steps into a vertical opening and, as the door revolves, one follows along in the pocket to the opposite opening and steps out. With the inlet or discharge valve the openings and the rotating member of the valve are in a horizontal position and the can, passing along on the can-runways, merely rolls into the pocket of the valve and is carried around with it and drops out at the opposite opening.

To determine the capacity of a cooker or its proper size, the following analysis is given. It is supposed that a plant is using No. 2 cans on a closing machine with a speed of 100 cans per minute and wishes to give them a 20 minute process. At this speed there will be 2,000 cans to be handled every 20 minutes and a cooker is required which will hold this number of cans. A cooker

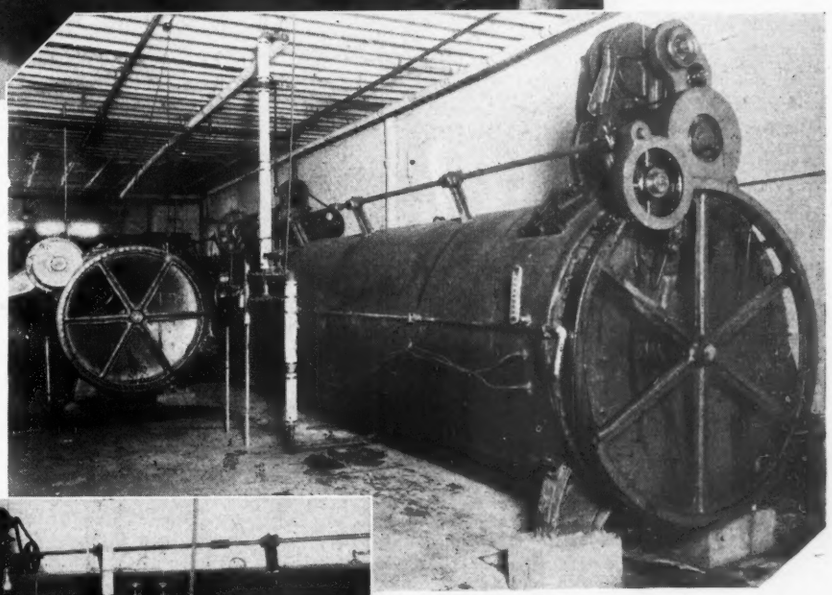
Sprague-Sells automatic crate dumper at Dickenson's Morton (Ill.) plant dumps hot cans into cooling tank that extends into the cook room



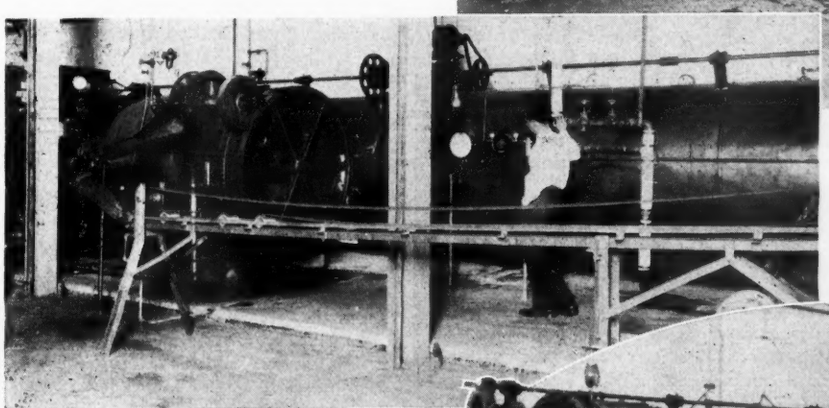
Modern Continuous Pressure Cookers and Coolers



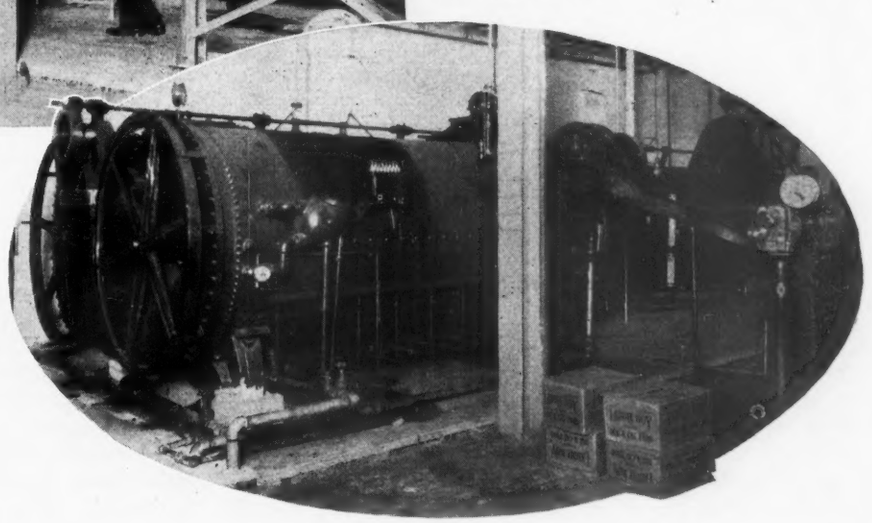
Control instruments conveniently located on an Anderson-Barngrover cooker



Inlet end of an Anderson-Barngrover continuous pressure cooker (and cooler in the left rear). The cans are elevated on an inclined track, the lower end of which is visible at the extreme right, and ascend to the inlet valve atop the shell.



Below: View of the A.-B. continuous pressure cooler of the unit at the Laddie Boy plant in Brooklyn. Mechanization reduced direct labor from 10 to only 3 and doubled the original output.



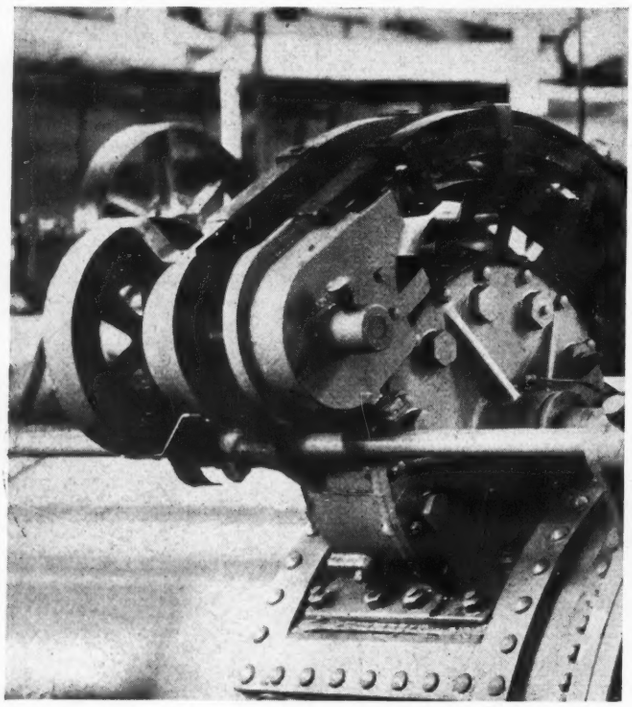
Above: Strangely enough, one of the most recent and best equipped installations is in a plant producing cat and dog food, and it has resulted in remarkable economies. In this view is shown the discharge end of the cooler, where the wet cans roll onto a steam-heated can dryer and thence to a labeling machine. There are no stops until the cans have been labeled, cased and sealed. An A.-B. unit.

handling No. 2 cans has a shell of such dimensions that the reel holds 42 cans for every turn of the helix, so that a cooker of 2,000-can capacity requires 48 turns of the helix. With a cooker of this capacity 100 cans per minute can be handled and given a 20 minute cook, but a longer cook cannot be given without cutting down the number of cans handled per minute. Any combination of time of process and of cans per minute which will equal the 2,000-can holding capacity, however, is possible. It is important to bear in mind, however, that at whatever the speed we determine to run, every can will remain exactly the same time in the cooker. No one can will hurry ahead of any other but will travel through in its own place and when the time is up for any given can to leave the cooker, and pass into the cooler, it will do it. The human element is eliminated. The cook room attendant cannot lose track of the time and give them a short or a long processing time in the retort, for the machine operates at a constant speed.

Two types of coolers are used with the continuous cooker, one being the so-called pressure cooler and the other of the open type. In either type the interior construction is similar to that of the cooker. In the pressure cooler the cooker and cooler tanks overlap with a transfer valve between. This valve is similar in construction to the inlet valve. The cooler is about two-thirds full of water and pressure is maintained automatically by compressed air which is sufficient to prevent permanent distortion of the cans due to the internal pressure in the can and yet is not enough to panel the cans when they are cooled and ready to be discharged.

The open cooler is used where the cans are small or where the process is not severe enough to distort them. After passing through the cooker they leave through the discharge valve into a short runway that carries them into the inlet of the cooler through which they then pass and leave on schedule time, just as was the case in the cooker. In leaving either type of cooler the cans pass into a conveyor and pass on to the labeling machine or directly to the warehouse.

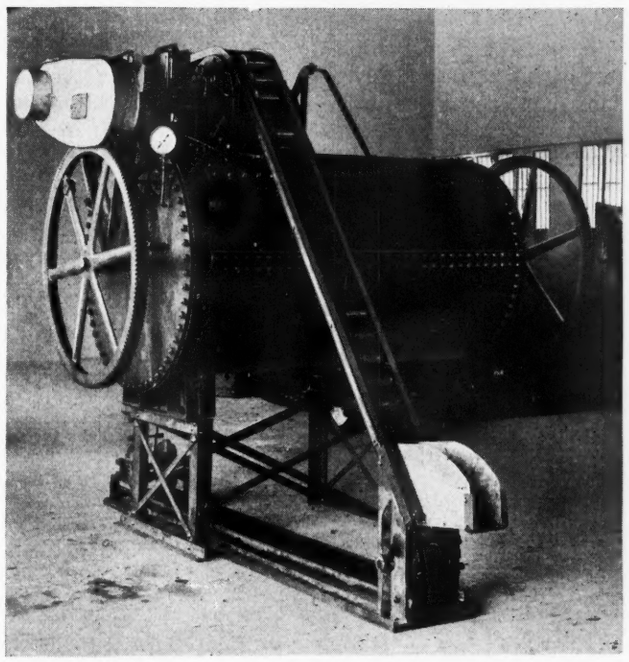
A detail of a very important feature of the A-B cooker—the inlet valve



All will realize that while the cans are being processed in the still-retort they are actually standing still. If they are carefully stacked in the baskets they are lying either on their sides or else standing on end as best suits the nature of the product. In the automatically loaded and unloaded baskets previously described they are lying on their sides, in the automatically loaded and unloaded retort they are standing on end. But in the latter they are stationary, and receive no agitation whatever. On the other hand in the continuous cooker there is a decided change of condition. Two types of these machines are made—one being classed as agitating and the other as non-agitating. In either type the can passes down through the machine in the same manner. But it is readily seen that, as the can is carried around the shell in the helical runway and resting on the reel, it will make only one revolution on its own axis for each turn of the helix; also that as long as it rests only on the reel this is the only turning motion it will receive. This is the action of the non-agitating reel. However, while it is passing around the lower half of the shell, if it can roll slightly away from the reel and rest on the shell it will receive a certain amount of extra rolling. This is the action of the agitating reel. The rolling action increases the rate of the heat penetration and aids in making a shorter process possible. This action or motion also is different from any condition existing in the still-retort and it must be taken into consideration in connection with any product packed.

FOR the packer having a steady and continuous run, or who believes it otherwise suited to his requirements, continuous cooking equipment is ideal, but it lacks the flexibility of the still-retort. In the non-agitating type only one size of can may be used in any one machine although in the agitating type of cooker a machine can be made to operate on two sizes of cans where the dimensions are fairly close, as is found in No. 2 and No. 2½ cans.

In retorts of any given dimensions it can readily be seen that for any given condition the consumption of steam per can or per case of canned goods is proportional to the number of cans in the retort during the period of operation. One of the largest factors in steam consumption is the radiation of heat through the retort shell and under any given conditions this will be the same regardless of whether there are no cans in the retort or whether it is full. Therefore the greater number of cans processed in a retort per square foot of shell per unit of time, the less steam will be used per can or per case. It is also self-evident that the longer the process the greater the amount of radiation. Also it is known that the higher the processing temperature the greater the amount of radiation and the greater the amount of heat absorbed per can. From this one can see that while it is possible, due to higher temperatures, to cut the process time, it is also possible that the steam consumption may be no less under the changed conditions than in the case of a lower temperature and a longer time. From tests which have been run it has been found that there is little to favor either type of cook, still or continuous, in so far as steam consumption alone is concerned, although it is well to remember that the tests were always handled under specially controlled conditions so that losses due to careless handling of equipment were eliminated.



Small continuous-pressure cooker by Berlin-Chapman

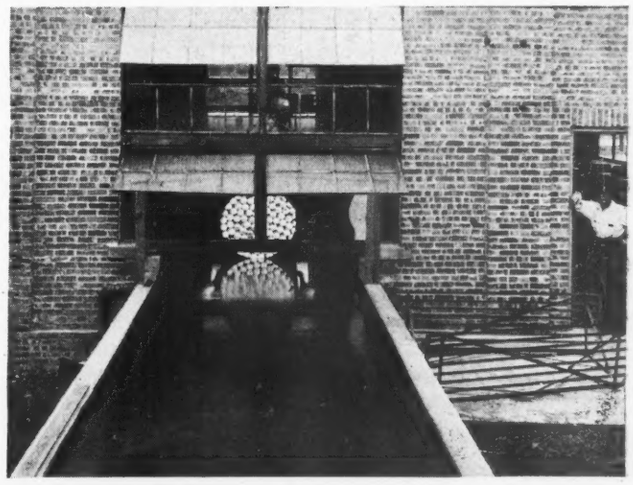
From the standpoint of steam usage the marked difference between still-retort and continuous-cooker operation is in the steam demand, which must not be confused with steam consumption. Steam consumption is the total quantity of steam used during a given period of time or required to perform a given amount of work while steam demand is the rate at which is used the quantity of steam required at certain periods of operation. With the still-retort there is a period during which there is no steam being used. The retort is either being filled, cooled or emptied. The boiler is under no load in so far as the retort is concerned. The operator puts the cans into the retort, closes it and turns on the steam to build up the temperature. Due to the large number of cans and the fact that everything is comparatively cold, a large volume of steam is required for a short period of time, thus making an excessive demand on the boiler during this period. As the retort reaches the process temperature the demand slackens off until, toward the end of the process period, there is little more than the loss of heat by radiation to be taken care of. This is the last step in a cycle of retort operations from no-load to a possible over-load and then back to the no-load condition.

Naturally a battery of retorts working in succession tends to balance the total load but, on the other hand, when two or more retorts are "coming up" simultaneously they will make the load even more unbalanced. In contrast, in the continuous cooker the heating up of the equipment is done at the beginning of the day's work and for the balance of the day's run the demand on the boiler is only that occasioned by the radiation and the quantity of steam neccessary to raise to the sterilizing temperature the number of cans entering the cooker. This makes a steady demand on the boiler throughout the entire day which at all times is somewhat greater than the steam demand per can at the end of the still process, but never as great as the steam demand per can at the beginning of the still process. Such a steady demand on the boiler is much more economical and easy to handle than one that is excessively variable and tends to reduce the load on a boiler which may possibly have seemed to be overloaded.

Cook Room Auxiliaries Are Important—Without discussing the relative merits or demerits of processing in steam or water there are some things worthy of notice where processing in steam is carried out. When processing in steam it is supposed that the drain valve is open enough to drain off the condensate. If it be not sufficiently open, condensation gathers in the retort or in the cooker shell. This is far better than having the drain valve opened too much, thereby allowing steam to blow out together with the condensation. It is good practice to have an efficient steam trap on the drain line to take care of this source of steam loss.

A positive method of assuring maintenance of the temperature of the retort or cooker at the proper point is essential. If the temperature drops a batch may be undercooked, or even non-sterile, so that it will cause much spoilage. On the other hand it may go too high and overcook the batch, and at the same time be a source of steam waste due to greater radiation and also to increased losses through the bleeders. Conditions in still and continuous cookers differ in their influence on the ability of the operator to hold the temperature constant by hand control, but the beneficial results of good control are the same. It is a source of technological safety and operating economy, therefore, to install an efficient type of temperature control in either system of processing.

A cause of loss, or lack of economy, is to be found in the cooling of the product. Without entering into a discussion of the reasons for proper cooling, we must admit that many faults exist in certain individual cooling systems. One recalls a channel cooling system which had been in operation for a number of years where admittedly it was giving trouble. The hot cans entering the cooling tank came in contact with such an overflow of water as was provided. When they had passed half the length of the channel they met with the fresh cooling water entering the tank at this point. Passing on toward the discharge end they entered a pocket of water in which there was no circulation of the water whatever, and the temperature was too high to permit holding one's hand in it.



Dumping hot cans into cooling tank at Eureka (Ill.) plant of Dickenson & Co. At the bottom of the tank is an apron conveyor

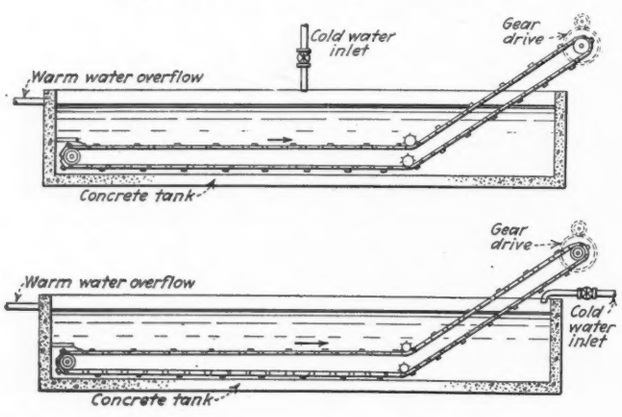
In another plant cooling was being carried out in the retort utilizing the pressure of the factory water supply

to maintain the pressure during pressure-cooling. Cooling water was admitted at the bottom of the retort and discharged through a line near the top. The piping system was very good. When starting to cool a batch the top valve was closed and the cooling water was admitted through the bottom line. The water rising from the bottom against the confined steam, held the original retort pressure until the retort was filled. Then, unless watched closely, the pressure quickly jumped up to the pressure of the factory water line. It was necessary for the attendant to be very much on the job at this time to release the pressure through the discharge valve. Of course this excess pressure would be taken care of by the safety valve, but often safety valves are set rather too high for this purpose. When the retort finally fills with water the attendant opens the discharge line valve to let out the hot water in the retort. Often, after getting the valve set so as to maintain a given water pressure in the retort, no further attention is given it until the cooling period is over. In a case like this it is very likely that an excessive amount of cooling water will be used. If the water supply is cut down and the discharge line is throttled to maintain the desired cooling pressure and further if the temperature of the cooling water at the discharge is kept only a few degrees below the desired temperature of the contents of the can at the end of the cooling period, then it will be found that the cooling will be accomplished just as quickly and with much less water.

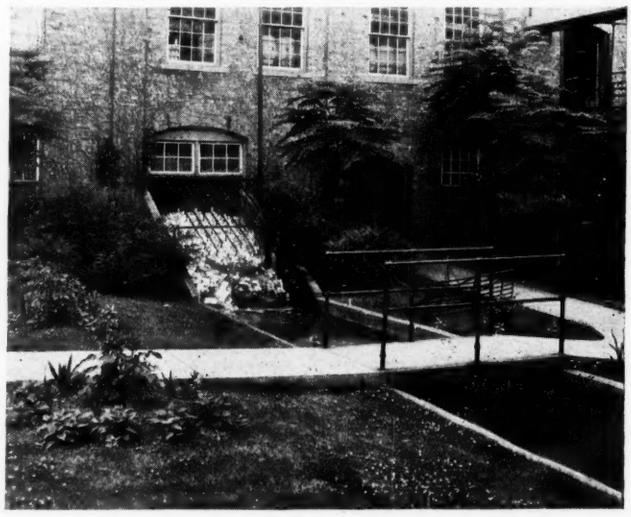
Automatic control of cooling water on still-retorts has not yet been worked out effectually and as long as manual control is employed it must be watched most closely.

In the continuous type of cooler used in connection with the continuous cooker the cooling methods are far more efficient. Cans entering the cooler come into contact with the cooling water at the time it is about to leave the cooler by utilizing the principle of counter-current flow. The water at this point is at a temperature below that of the cans entering it, although many degrees warmer than the fresh water entering at the other end. The cans passing on toward the discharge end of the cooler progressively come in contact with cold water because the inlet for the fresh cooling water and the can-discharge valve are in the same end of the cooler. The method of counter-current cooling is the most economical of all systems. In the early machines the water passing out was controlled by a hand-operated valve, but more recently a very effective equipment has been developed to let the water out automatically when it has reached a given temperature, while at the same time allowing fresh water to enter at the other end. This equipment gives no trouble, relieves the operator of a part of his work and gives more constant cooling conditions than can be possible with the hand-operated valves.

Two ways of getting cold water into a submerged belt cooling tank. Above: wrong. Below: correct



All packers have a code or key mark on their cans which tells them what is in the can and when it was packed. Most packers have forms for recording the retort-room operation that are supposed to tell them what took place in the cook room on each day of packing, but there are many errors on these cards. When using the still retort it was easy for the operator to make mistakes on the temperature when it was controlled by hand, and for this reason most retorts are fitted with automatic steam regulators. In addition to this it is found that an automatic record of temperature and time makes one of the best and most positive of cook-room records. With the continuous cooker the time of processing is positive and constant so long as the power is on, but here also the temperature record is of great value. It is a proof, at any future period, that nothing was out of order at any particular time.



Discharge end of cooling tank showing cans ascending under final showers and passing into the warehouse of Dickenson & Co.

In dealing with efficiency in cook-room practice one of the most important factors to take into consideration is that of heat radiation. With vertical retorts good insulation is rather difficult due to the location of the loading and unloading opening in the top and the fact that water from that source and from the overflow from cooling so often runs down the side and quickly ruins the insulating material. Horizontal retorts are much easier to cover and take care of. The amount of heat radiation depends upon the surface exposed and the difference in the temperature of the inside and outside of the shell. The lower the process temperature and the higher the room temperature, the less the amount of heat radiated per unit of time, but as mentioned before, it goes on regardless of the number of cans in the retort. For this reason one should always try to get the greatest number of cans possible into a retort when processing by the still method and always keep a continuous cooker working to its capacity. Good insulation on any type of cooker will save steam in any processing operation, and the increase in cans or cases per unit quantity of steam is quite noticeable if means are at hand to check the steam consumption.

Great Economies Made Possible

BY *Local Dehydration* OF

SUGAR BEET

By B. J. OWEN
Director, Institute of Agricultural Engineering, University of Oxford, England

Beets stored in sheds at beet sugar factory, Ontario, Canada — Keystone View

SINCE 1925 a steadily growing interest has been aroused in Great Britain and on the continent of Europe in the new process of sugar manufacture known as the "Oxford Desiccation Process," now being operated commercially at Eynsham, Oxfordshire.

From the time of the invention of the diffusion process by Dombasle in France and its final development by Robert in 1860 in conjunction with Rousseau's double carbonation process, no really vital discovery has been made which could effect an economy in the manufacturing process.

The great disadvantage of the diffusion process arises from the fact that the beet in its fresh state is perishable and cannot be stored for any length of time without deterioration and loss of sugar. It was realized from the earliest days of beet sugar making that a method whereby sugar beet could be preserved for a long period would be a valuable improvement, since it would allow the working season of the factory to be extended and so reduce overhead charges; stabilize labor and eliminate some of the technical difficulties with which the manufacturer was faced. Margraf, the German chemist, who was the first to extract sugar from beets, did so from dried roots, and since that early date (1747), many attempts have been made to perfect a preservation process. Storing in cellars or in earth, refrigeration and various other methods were proposed, but the main work was centered on the development of a dehydration process. Schützenbach in Galicia, Lafeuille in France, Benjamin and McMullen in America, and, in recent years, De Vecchis in Italy, developed systems of drying, and in some cases actually erected plants. For various technical and economic reasons the processes appear to have been unsuccessful.

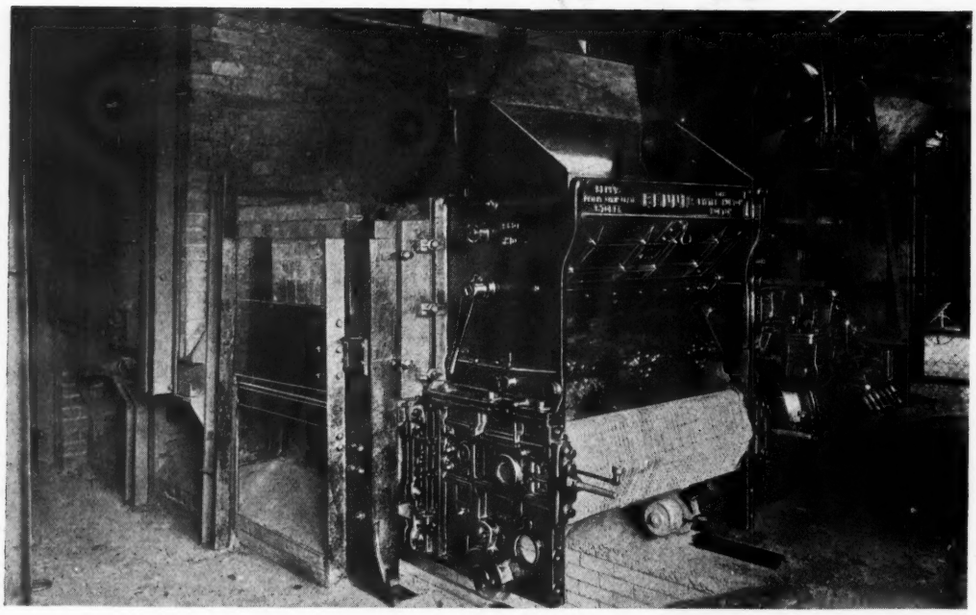
In 1924 the English Ministry of Agriculture appointed a commission of inquiry to investigate the De Vecchis process, which was then in operation in Italy, with a view to its adoption and development in England, where a definite attempt to establish a sugar beet industry was being made.

The commission reported that the principle of drying beets to preserve them appeared to be sound, but that, technically, the De Vecchis process was not satisfactory. In view, however, of the work done and the information that had been gained in England, particularly at Oxford University, on the drying of agricultural crops and organic material generally, they considered that it might be possible to develop a process which would be technically sound and economically satisfactory under English conditions. At the request of the Ministry of Agriculture research was undertaken by the Institute of Agricultural Engineering, Oxford, and the process as it now stands was the result of this work.

The problem to be solved was the removal of the surplus moisture content of the beet, amounting to approximately 77 per cent of its weight, with an economic consumption of fuel, in such a manner that the sugar content remained unharmed.

When drying, beet sugar may be destroyed by inversion, whereby sucrose of the beet is turned into an uncrystallizable invert sugar under the influence of heat, acidity, or biological ferments present in the living root; or, by overheating the material under certain conditions, when the sugar is burned or caramelized, also resulting in a loss. These changes also give rise to difficulties in the manufacture of sugar.

Up to the time of the Oxford experiments beets had been dried either in rotary dryers or on multiple belt dryers. In both cases the sliced beet was disturbed during the process. At Oxford a method of "mass" drying had already been applied to other crops with con-



Furnace from which gases are taken, showing details of the mechanical grate.

siderable success. The essential feature of this method was the control of the natural thermal reactions occurring in living organic products, together with general evaporation. Such a control was obtained by regulating the relations of time, temperature, and moisture.

De Vecchis at his works in Italy treated the beet in two separate operations. The first operation was to remove the moisture. By a second operation, consisting of a prolonged heating of the dried cossettes, he claimed that the albuminoids were coagulated and as a result a purer juice was obtained and that the cell walls were cracked so that on simple lixiviation with hot water a concentrated juice of 50° to 55° Brix was produced.

IN order to test the De Vecchis process and to obtain further data, a small laboratory extraction battery, and later a larger plant, was constructed at Eynsham.

As a result of work carried out with these plants the following facts were established:

1. There is no cell rupture, therefore extraction can take place only by diffusion.
2. The albuminoids are coagulated, the second operation, however, being uneconomic and productive of invert sugar.
3. The juices obtained from dried cossettes are purer and much more concentrated than those obtained from fresh beet.

Experimental work proved that the amount of inversion depends upon the time of drying and the temperature of the drying air in relation to the moisture content of the material. Caramelization depends upon temperature in relation to moisture content.

By drying beet cossettes in a mass 7 inches to 8 inches deep that remained undisturbed during the whole course of dehydration and by supplying air at definite temperature, the volume and velocity of which were correlated with the moisture content of the material, an efficient drying was secured, giving an evenly dried product without loss of sugar, a result which had not previously been obtained.

If a temperature exceeding 180° F. be applied to the beet cossettes when approaching dryness inversion is likely to occur; with dry material, caramelization occurs at 230° to 266° F. Half dry material is not liable to inversion up to 230° F. and if the material is wet 260° F. may be applied without danger.

On the basis of these considerations and figures it was possible to develop an industrial process on mass-drying principles and to construct an efficient drying plant. A factory with a capacity of 25,000 tons of fresh beets was erected at Eynsham near Oxford by a private company, Messrs. Sugar Beet & Crop Dryers, which had previously purchased the experimental factory with the patent rights.

IN the Oxford dryers the beet cossettes are treated in continuous progression on a conveyor belt as is shown by the accompanying diagram. The cossettes are fed to the conveyor belt by an automatic leveller, the depth being regulated to about 7 inches. At the discharge end the belt is cleared by an automatic scraper and the cossettes conveyed to the cossette store by an automatic belt conveyor. The air is so passed through the dryer that the material is dried progressively in three stages, separated from one another by air-locks. In each of these stages the material is subjected to a definite temperature which is correct for the state of the material at that stage.

The air is heated by mixing atmospheric air with the gases from a coal furnace. Air enters the dryer at the end where the dried cossettes are leaving and is forced by a fan through the layer with a comparatively low velocity at a temperature of 180° F. After passing through the layer of nearly dried cossettes the air supply is augmented by the addition of more air, reheated by the admixture of fresh furnace gases in a specially controlled mixing chamber, and by another fan forced up through the second stage at a temperature of 230° F. This in turn is reheated and forced up through the first or fresh stage at 260° F., being finally discharged at a temperature of about 120° F.

The total period of drying is about 50 minutes and approximately 65 per cent of the moisture is removed in the first stage in 15 to 20 minutes. In the second stage a further 25 per cent is removed and the remainder in the third or dry stage.

The volume of air at each stage is so regulated that it is sufficient to remove the desired quantity of moisture. The velocities, however, for each stage are governed by

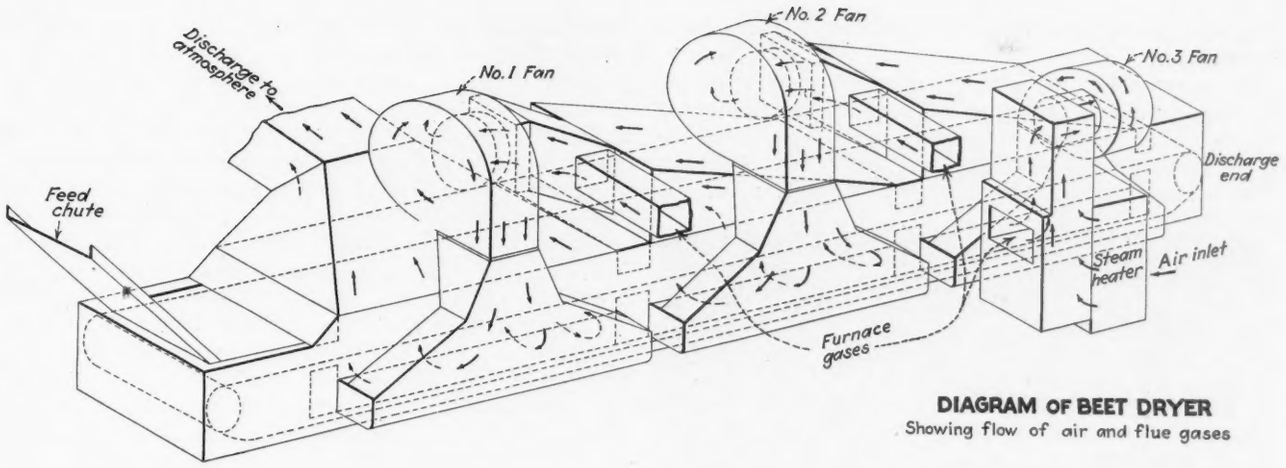


DIAGRAM OF BEET DRYER
Showing flow of air and flue gases

certain considerations, for example a velocity that would fail to move wet cossettes would blow nearly dry cossettes off the conveyor. Also, velocities are limited by economic considerations, as any increase in velocity involves a disproportionately greater increase in the amount of power required.

The results of two season's work has been very informative. Furnace gases were used without any assistance from either exhaust steam or recirculation of air. Drying was carried out with a coal consumption of approximately 9 per cent of the weight of the beets. This shows a good efficiency but with improved arrangements the figure can be reduced to a $7\frac{1}{2}$-per cent overall coal consumption.

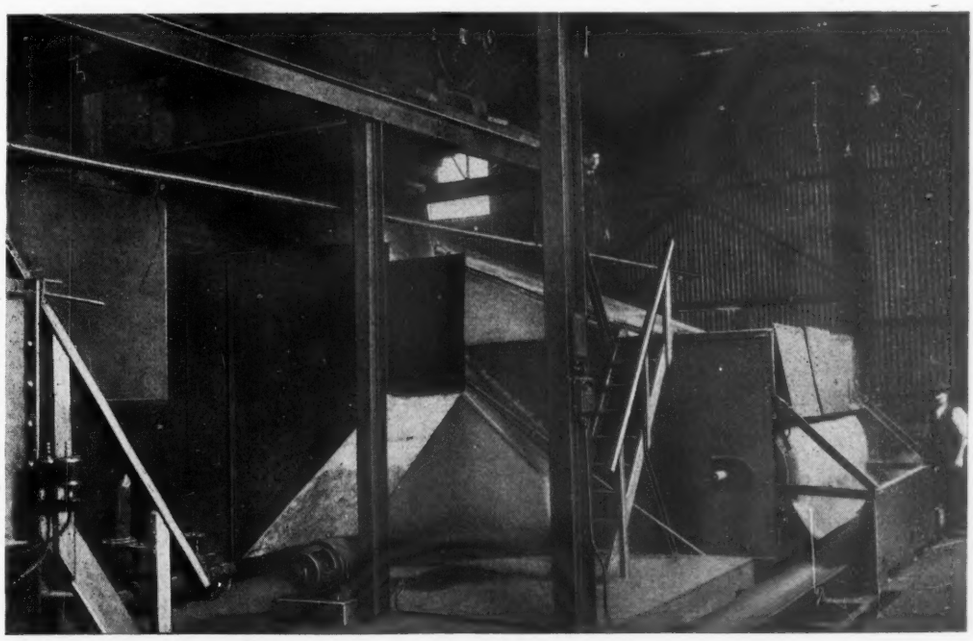
The company is now developing the dryer for use in area drying stations and a dryer with a capacity of 5 tons per hour has proved to be the most economic unit. Grouped in such stations a sound economic advantage can be shown, particularly when it is realized that fresh beet cossettes, which occupy 60 cubic feet per ton, are reduced in weight by 75 per cent and in volume to 30 cubic feet. By mechanical compression this reduction in volume can be further increased.

As a sequence to the drying process a method of sugar manufacture from the dried cossettes has been developed. In the usual method of extracting sugar from fresh beet by diffusion the resulting juice has a sugar concentration of from 12 to 13 per cent. This juice is purified by a double carbonation process and concentrated in a multiple effect evaporator to a density of 50° to 55° Brix. In the Oxford process the juice is extracted in practically the same manner, but with a concentration of about 50° Brix. Owing to the effect of drying it is much purer and more easily treated.

Purification is comparatively simple. The raw juice is limed until only slightly alkaline and passed through a centrifugal clarifier, which removes the whole of the suspended impurities. A juice is obtained which, after filtration through decolorizing carbon, is passed directly to the vacuum pans for the production of a high quality white sugar, the multiple effect evaporation station of the ordinary process being eliminated.

Examination of the economic conditions of the British beet sugar industry at the present time shows that unless the subsidy which the British government decided in 1924 to provide for the encouragement of the industry is continued, the ordinary factories cannot work at a profit unless the price to the grower of beets is so reduced as to make it an unprofitable crop.

Some substantial reduction either in the cost of pro-



Discharge end of dryer, showing fan for third stage and band conveyor to cossette store

duction of sugar or in the cost of growing the crop must be effected.

At present the net average cost of growing sugar beets in England, including delivery at the factory, is 44s. 6d. ($10.84) per ton. The cost of transport of the fresh beets from the field to the factory is a serious item. The large acreage necessary to provide for the

Dry cossette store

needs of the ordinary "diffusion" factory often entails the conveyance of beets from considerable distances.

On the average the percentage composition of unwashed beets is approximately:

Water	64.6
Sugar	13.5
Fiber and other non-sugars	5.9
Dirt	16.0

In other words, for every ton of sugar produced the factory must handle nearly 6½ tons of beets and about 1½ tons of dirt. It is removed, and only the dried cossettes sent to the factory.

With the diffusion process all factory work must be completed within three months or so of harvest, in order to avoid deterioration of the beets and loss of sugar. This necessitates the erection of a factory from three to four times as large as is necessary if the work could be spread over the whole year.

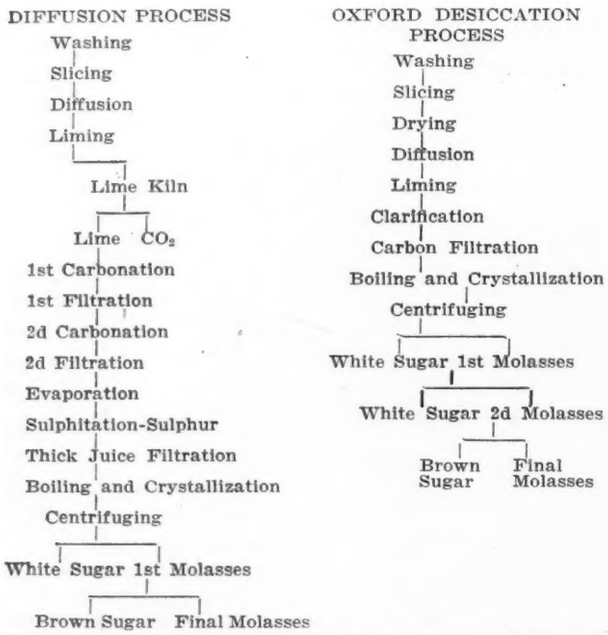
After the sliced beets have been dried by the Oxford process it is possible to preserve the cossettes for an indefinite period and to continue the manufacture of sugar during the whole year, thus effecting a large saving in capital expenditure, as well as raising the efficiency of the work-people by stabilized labor conditions.

Again, the working of dried cossettes instead of fresh beets simplifies the extraction process. The extraction battery necessary for dried cossettes is considerably smaller than that required for fresh beets, as the juice produced is more than three times as concentrated, and the working period is greatly extended. Also because of the simplified purification a substantial amount of the plant is eliminated, and what is retained is much reduced in size. Carbon dioxide and circulating pumps are dispensed with, and less steam for power is required. Furthermore, the consumption of steam for heating is about one-twelfth of that required for double carbonation.

The additional plant required in the desiccation process is for drying and storage. The drying machinery operates during the first three months of the campaign and the power required is not more than that required for those operations in the diffusion process which are eliminated in the desiccation process.

It would appear, therefore, that the Oxford process overcomes most of the economic difficulties which face the diffusion process after the abolition of the governmental subsidy. It should benefit both the grower and the manufacturer, and if used as an auxiliary process in the existing diffusion factories, should greatly increase their scope.

Flow Sheets of the Two Systems



Estimated Operating Costs for Factory Dealing With 100,000 Tons of Beet

	Per Ton of Beet £	s.	d.	U. S. Equivalents— Pound Sterling = $4.872
Beet reception			8½	$0.17
Washing and slicing		1	0½	0.25
Drying		4	0½	0.98
Extraction		7	9½	1.90
Carbon revivification		1	1¼	0.27
Pulp drying		2	9½	0.69
Effluent		1	1½	0.27
Contingency			2½	0.05
		18	9½	$4.58
Revenue from pulp and molasses		8	0	1.95
Net Cost		10	9½	$2.63
Net cost per ton of sugar =	£3	16	10	$18.72

It should be particularly noted that in the above manufacturing costs are included effluent treatment; also repairs, maintenance and depreciation, laboratory, and general overhead expenses. The figure applies to white sugar which is generally produced in England.

The factory works on three 8-hour shifts and the rate of pay varies from 50 shillings ($12.18) to 70 shillings ($17.05) per week depending on the function of the workman. The coal used contained 13,500 B.t.u. per pound and costs 20 shillings ($4.87) per ton. For purposes of comparison it might be added that the average factory in England of the same capacity produces sugar at a cost of about £7 10s. ($36.54) per ton. Further, the establishment of local drying stations supplying a central extraction factory would result, under English conditions, in a saving of transport costs of about 13 shillings 4 pence ($3.25) per ton.

Improving Protein And Color Qualities

IN MACARONI WHEAT

By T. C. ROBERTS*
Washburn-Crosby Company

IT SEEMS desirable, in commenting upon the possibilities of improving the quality of durum available for the manufacture of macaroni in this country, to outline briefly not only the current situation but also the underlying causes. It is a matter of common knowledge to every macaroni manufacturer in the United States that the amount of durum raised in this country is from four to six times the total required at the present time to take care of the needs of the macaroni industry, and in spite of that fact the semolina millers find it difficult in many crop years to purchase sufficient quantities of durum of high enough quality to meet the standards for top quality semolinas.

From all that I have been able to gather in talking with agricultural experiment station men, millers, grain buyers and seed dealers I believe that the durum situation has been growing steadily worse for a number of years until a few years ago it became almost impossible to procure any quantity of pure durum seed of a single variety. The situation finally became so bad that several agencies set to work independently to better it if possible, and they are, I believe, beginning to accomplish something. This is a matter I wish to take up in more detail later.

EARLY SPECIMENS OF DURUM DISAPPEARED

The reasons underlying the introduction of durum wheats into the United States have had much to do with the present situation. So far as I know, Arnautka durum was first distributed by the Department of Agriculture in 1865. It was sent into different parts of the country and apparently disappeared. Around 1900, cerealists of the Department of Agriculture gave serious study to varieties of durum adaptable to conditions in the United States, and the recognized growth of durums in this country dates from approximately that date.

In the early literature on the subject there is, it is true, repeated reference to the desirability of the durums for macaroni and paste manufacture; but there also is constant reference to their value as a source of high quality bread flour. While the value of durum for macaroni manufacture was thus early recognized, there was no standard for comparing the desirability of varieties for this purpose set up regularly in connection with experimental work until comparatively recently. The earlier reports are full of comparisons based upon bread baking.

Durum gained headway just prior to the serious rust epidemic of 1904. While the durum varieties grown were more or less seriously affected that year, it was demonstrated clearly through the whole Northwest that they were more resistant to the effects of black rust than the bread wheats. Much of the work that was done in succeeding years in developing new varieties of durum for this area was based largely upon comparative rust resistance.

Unfortunately many of the durums developed for rust resistance are of low quality for macaroni manufacture in that they are lacking in that clear yellow color considered so desirable in this product. In addition, the Kubanka durums imported by various agencies and the Arnautka and other durums brought in by Russian immigrants were a mixture of several varieties.

COLOR VALUE A RECENT STUDY

The character of durum produced at present doubtless is due in considerable part to the fact that main emphasis was placed for many years upon other factors than desirability for the manufacture of high-grade macaroni products. In the last six or seven years, however, we began to find the gasoline color value of different varieties of durum recorded in experimental reports, and for a number of years both the Department of Agriculture and the North Dakota Experiment Station have been in the habit of submitting samples of known durum varieties and of new durum varieties to the semolina millers for opinions as to their commercial desirability. As a result of this work and of such experimental study as the semolina mills carry on as an aid to improving their production, one or two varieties of durum have become recognized as outstandingly desirable.

In 1927 the grain buyers for the mills met, appointed a committee, and each made a contribution to be continued for at least five years for the purpose of improving durum. A considerable number of charts

*An Address before the National Macaroni Manufacturers' Association, New York City, 1929.

showing the wheat, semolina and macaroni from comparable samples of different varieties of durum were distributed to county agricultural agents, country elevators, and the like. The North Dakota Experiment Station assisted by publishing a list of available sources of durum seed wheat, confining this list almost entirely to the variety Mindum, which all experimenters agreed upon as the most desirable. Since that time the Northwest Crop Improvement Association has been organized to take over a number of independent activities all of which were attempting crop improvement work of one sort or another in that territory. This agency is now handling the funds referred to above.

The main purpose of this consolidated organization is to improve the quality and the yield per acre of Northwestern crops. It is steadily establishing closer contacts with agricultural stations, with county agents, with farmers' associations, and is showing progress in transmitting information of commercial value to the farmers regarding the actual acceptance of the crops being raised and the possibilities of increasing the quantity acceptance. There is, therefore, already a consciousness of the fact that color in durum wheat can be improved and some definite steps have been taken to attempt to promote the growth of the variety which at present apparently offers the best possibilities of color improvement.

Quality Is Difficult to Record

Protein in semolina is judged as to quality and quantity. There is no satisfactory basis for measuring quality except by physical testing of samples by skilled operators, and even then there is frequent disagreement on account of the human element involved. Moreover, it is by no means certain that some so-called quality differences in protein are not due rather to the presence or absence of other factors. Quality differences therefore are difficult to record and to discuss. Quantity is easy enough to measure, of course, and quantity of protein is a variety characteristic of wheats as well as one that is influenced considerably by growing conditions surrounding a given crop—some varieties of wheat naturally contain more protein than others when raised under similar conditions.

In regard to bread wheats, we know that some of the naturally high protein wheats have undesirable features which make their extra protein of no additional value. There is little reported about significant differences in quantities of protein among different durum varieties, except that Monad apparently is higher in protein than other varieties. Monad durum, however, is one of the least desirable varieties from the point of view of color.

In addition to the possibilities of improvement in color through the distribution of information as to the most desirable varieties and the accumulation of seed of those varieties, there also is the possibility of improvement in color, and in protein as well, through the development of new varieties either through crossbreeding, selection or importation. The fact that such work all requires elaborate testing over a number of years and under varying climatic conditions before recommendations regarding any new variety can be made on a sound basis indicates that this work should be done by government or by state authorities rather than by private individuals.

Any discussion of the possibilities of improvement is not complete without mention of the principal factors limiting such improvement.

First, we may be able to improve the general average of a crop, but we cannot control the weather, and weather in any given season is very considerably responsible for the character of that particular crop. Therefore such improvement cannot be expected to do away with seasonal variation.

Second, the dissemination of information and distribution of seed of better varieties is of little value in the long run unless the work is constantly pressed to the end that undesirable varieties are pushed completely out of the picture. It is impossible either on the farm or in the country elevator to devote more than a very limited number of bins to any one variety of grain. Consequently an area growing both desirable and undesirable durum types will in all probability market them as a mixture.

To any individuals seriously interested in attempting to improve the character of the durum crop, it should be emphasized that constant interest over a period of time is of the utmost importance. The development of new wheat varieties is a long, slow undertaking, and, barring a terrific calamity such as an overwhelming rust epidemic, the job of convincing the farmers of a large locality that they should change varieties is a slow one. The men who are engaged in this work need and appreciate interest and encouragement from the commercial industries which will be influenced by the results of their work. In addition, such interest will insure these industries some say in the conclusions drawn, and it is highly desirable that both plant breeders and publicity men be kept constantly in close contact with the commercial viewpoint.

At the present time the Cereal Crops and Diseases Department of the Bureau of Plant Industry in the Department of Agriculture has plans drawn for elaborate work on durum investigations. An interest on the part of the industries concerned doubtless will be of material assistance to the department in obtaining further funds for this work. I also suggest that any interest expressed through associational activity, the farm papers and grain trade journals, in the form of comments upon the qualities most desired in macaroni and upon the possible improvement in demand for macaroni resulting from those characteristics, would be of considerable importance in furthering the campaign under way at present.

In short, various agencies are now doing some work in attempting to improve the character of the durum crop on the basis of improved quality for semolina manufacture. The experimental agencies working on durum wheats are more than willing to receive advice from the commercial users of durum products, and a sustained interest, therefore, on the part of all who are interested is at this time particularly likely to accomplish good results.

New Fragments Yield Salad Oil

An oil suitable for salad dressing and other food products can be made from the waste fragments of pecan nuts accumulating in shelling plants, according to the Department of Agriculture. The oil has a mild, agreeable, and characteristic flavor, according to the experimenters, and is of excellent quality.

The main precaution necessary is that the oil be pressed before the nut waste becomes rancid if it is to be edible, the report points out.

Cutting asparagus on F. E. Booth Company ranch

Control of Raw Material

AND ITS PRE-FACTORY TREATMENT

Essential to Quality Production

Why the Asparagus Canner Must Be A Farmer as Well as Manufacturer

By EARL D. STEWART
Assistant Editor

A STRIKING EXAMPLE of the modern trend toward the canner's production of his own raw material to the end that he may be assured of a steady supply of raw material the quality of which is under his positive control is found in the canning of asparagus. It is also a most interesting story of the steps taken to improve the quality of a finished product. The canning operations are of interest because the shape and nature of an asparagus stalk make necessary many hand operations, which have hitherto not been amenable to machine operation.

To get at the reasons for the asparagus canner assuming the burden of asparagus culture, it will be necessary to consider briefly some of the aspects of asparagus growing and a little of the history of asparagus handling and canning methods.

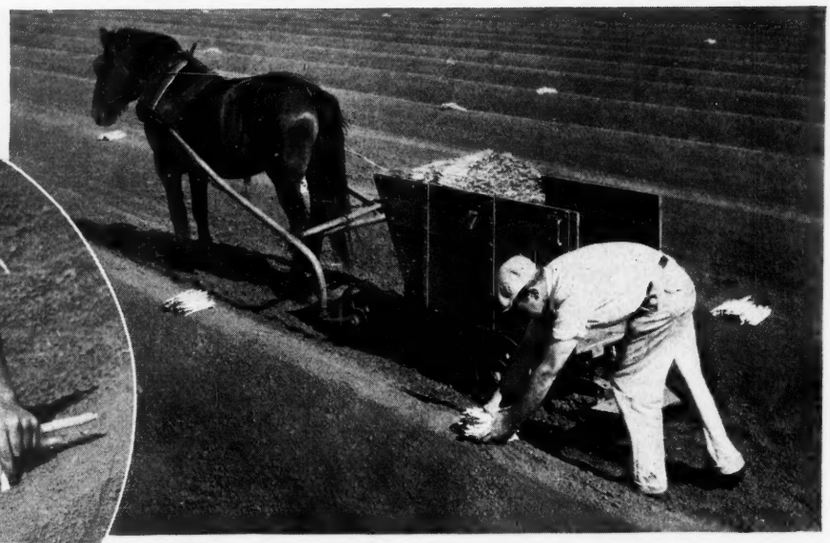
The asparagus plant has been widely known and used as a food for many centuries. It probably originated as a swamp plant in eastern Asia and was carried westward into Europe by successive migrations, and domesticated in France, Belgium and England. According to the *Encyclopedia Britannica,* it grows wild so abundantly on the Russian Steppes that it is eaten as a forage plant by cattle and it is also said to grow wild along the southern coast of England. It has been highly prized in France for many years, that grown at Argenteuil, near Paris, being considered the finest. The Argenteuil variety has been grown in the United States to some extent, but is being supplanted by the more rust-resistant Mary Washington and Martha Washington varieties.

Asparagus requires a light, sandy or silty soil, well watered and well drained, through which the spears can easily force their way without becoming bent and distorted and without scarring and damaging the tender epidermis. This requirement limits the growing of asparagus on a scale sufficient for canning to a few regions, of which the delta region of the Sacramento River in Sacramento County, Calif., is the largest. Here the river has spread out into many branches, forming numerous islands which formerly were flooded at high water each year but most of which are now protected by levees. The deposits of silt, sand and muck that have accumulated on these islands for untold centuries make a soil that is nearly ideal for asparagus culture.

Seed is sown in nurseries in early spring in rows about 30 inches apart. Best results are obtained if individual seeds are placed 3 to 4 inches apart so that there will be no interlocking of roots to prevent easy sorting when the roots are dug for transplanting. During the first year the young plants grow to a height of about 4 inches and the root system responsible for future crops develops. In the fall, usually after a killing frost, the tops are mowed down and burned. Roots may be dug for transplanting and stored at about 40° F. or allowed to remain in the ground and dug in the spring.

At this stage the roots are called "crowns." They possess a central rhizome with numerous buds for future spears and a well developed radial root system. They may be planted in the spring before danger of frost is over, provided they are covered promptly with a few

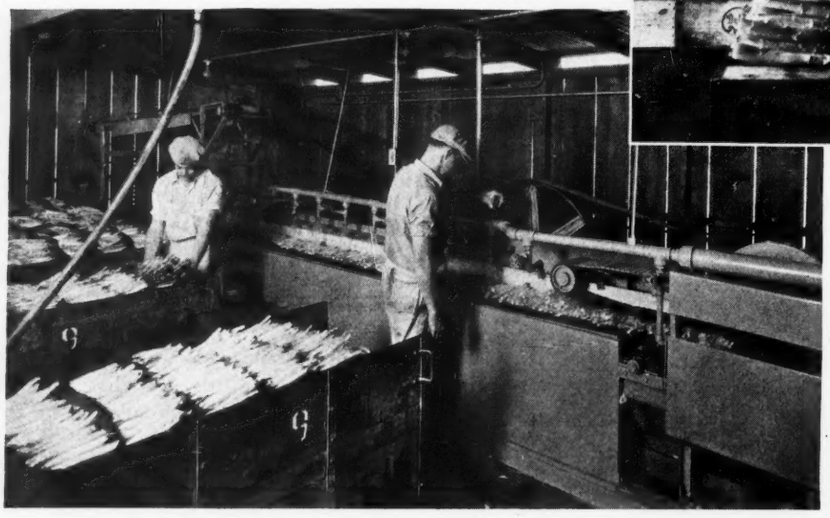
Left: Cutting asparagus by thrusting the chisel-shaped knife into the hill. These tips happen to be much farther out of the ground than usual.



Above: Gathering asparagus in the field after it has been cut and laid on the hills.

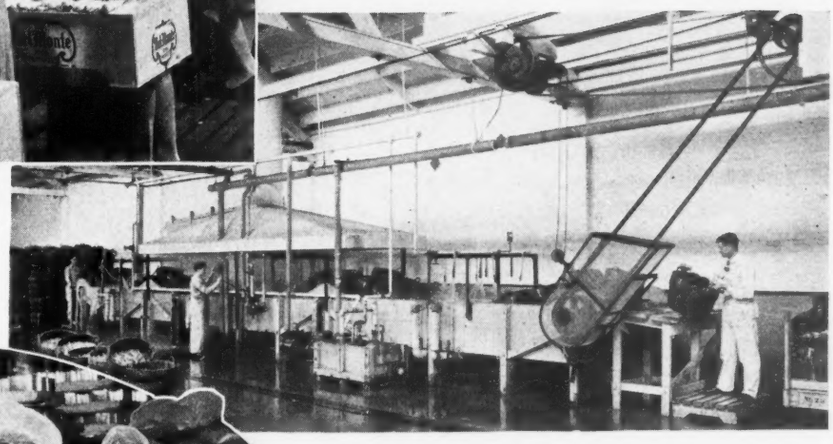
Unloading sleds by skid track. Here is where the casters come into use. Note the canvas cover for each sled.

Hand-washing asparagus. With the loop attached to the operator's thumbs he can easily handle large bunches.



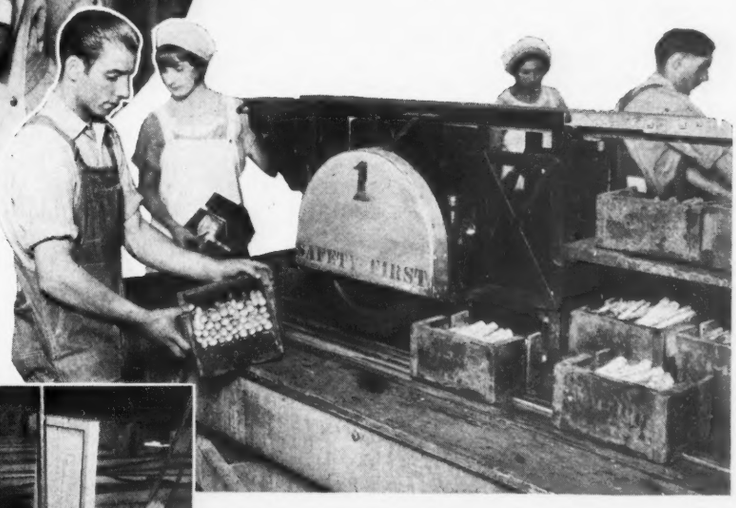
Asparagus washing and butting machine, in which the stalks are held firmly between the upper and lower belts while cutting off the butts.

Grading asparagus for size and color. The notched strip of wood is the gage for butt sizes. Six sizes and two, or sometimes three, colors are recognized: White, purple, and green.



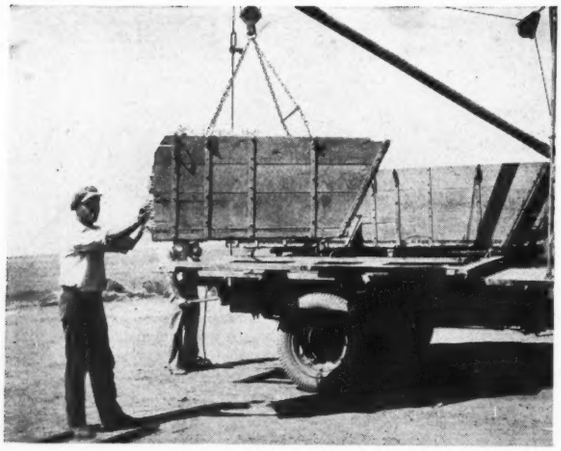
A recent development in asparagus blanching: The continuous blancher with variable speed drive. The tips are washed in cold water, then blanched in hot water, and finally rinsed in cold water.

Packing blanched asparagus in tall, square cans.



The "grass" is cut to a length dependent on the grade. The position of the guide slot on the bottom of the box regulates the length of the cut stalks.

Filled cans being brined at the entrance to the exhaust box.



Loading the filled sleds onto a truck

inches of soil. The crowns are planted in rows 8 feet apart with 16 to 22 inches between crowns. Three thousand to 3,500 plants are required to the acre, depending on the distance between them. Growth is not great the first year after transplanting and there may be no harvesting, or if any spears are cut the yield is small—about 200 pounds an acre. This "grass" is usually harvested green and marketed fresh.

Beginning with the second year the asparagus is cut annually from March to July, the yield increasing year by year from about 400 pounds per acre to 6,000 to 7,000 pounds in the eighth or ninth year, or nine to ten years after the seed was sown in the nursery. Yields of 8,000 pounds an acre have been reached on Ryer Island in the Sacramento delta region. Harvesting is continued up to the twelfth to fifteenth year. After this time the spears are small, wiry and tough and suitable only for green soup cuts. Land which has raised asparagus for a period of 12 to 15 years is usually not considered suitable for further asparagus culture, and it has been the practice to move to other areas.

At the beginning of each season the asparagus is harvested green for the fresh market, but as the season advances and the demand for fresh asparagus declines, earth is heaped over the rows to a height of about 14 inches and white asparagus is produced for canning purposes. It was formerly commonly supposed that the white asparagus was bleached by artificial means but such is not the case. The whiteness is due to prevention of chlorophyll formation by growth through several inches of soil and is entirely comparable to the similar method of blanching celery. At the end of the cutting or harvesting season the asparagus is allowed to grow normally until the tops are killed by frost. The fields are mowed and the hills "knocked down," ready for the next year's growth.

A large asparagus field is a curious picture with its long rows or ridges, apparently naked of any growing thing, stretching away toward the horizon. It is only by close examination that the delicate, greenish-white tips can be seen thrusting their way through the sandy soil. Asparagus grows very rapidly, as much as 4 to 6 inches a day at the height of the growing season. It must be cut frequently, therefore, if the spears are to be tender and free from "sunburn."

Cutting the asparagus is done each morning. The cutters (usually Chinese or Filipinos) are equipped with a chisel-shaped knife on the end of a handle about 2 feet long. The cutter walks along the row, thrusts the knife into the loose soil and cuts off the spears that protrude through the top of the hill. As do workmen in many similar operations, they become astonishingly expert, and the spears are removed to a uniform length of about 9 inches. The cutter carries the stalk in his left hand until he collects a dozen or so and then lays them on top of the hill.

When the asparagus is cut and laid out on the tops of the hills the purely agricultural aspects of asparagus growing and canning cease. It is from this point on that improved methods of handling have made a change from the tough, sunburned, poorly washed and graded, product canned a dozen years ago to the clean, uniform, and tender delicacy now obtainable in canned form. It is doubtful, at least, whether asparagus canned as it was in the past would be marketable at all nowadays.

Though the account of asparagus culture just given is very brief it is sufficient to indicate that considerable labor as well as a long period of waiting is necessary before a ranch comes into profitable bearing. Large scale operation with much labor-saving machinery has proved most satisfactory, particularly as the quick canning methods in modern use require many laborers and close supervision of their work.

After the asparagus is cut and laid on the hills, it awaits the arrival of the "sled boy." An asparagus sled consists of a small wagon-box minus a rear end-gate, mounted on casters. The casters enable it to be rolled onto channel irons fixed to a low-wheeled one-horse cart, as well as to facilitate handling at the wash sheds. The cart is driven between the rows and the sled boy picks up the bunches of asparagus laid out on the hills by the cutters, and stacks them in the sled with the tips to the front.

The earlier custom was to use few sled boys and to allow several rows of asparagus to accumulate before gathering it, and the cut spears might lie exposed to the blazing California sun for several hours. It was then taken by the same sled to the washing sheds, several of which were scattered at various places on the ranch. Here the washer gathered up, by means of a cord attached to both thumbs, a bundle of a hundred stalks or so and swished it back and forth a few times in a vat of water. If water was plentiful and the vat was kept overflowing, and the grass had not lain in the sun too long, it might be washed fairly clean. But if, as frequently happened, there had been no wind to operate windmills for several days, and water became scarce, the washing became most inadequate, indeed. Some independence of the wind was gained by the use of portable gasoline-engine-driven pumps but there still remained the problem of the closely adherent film of soil, baked on by the sun, and which could not be removed by simple rinsing.

After the "washing" operation the "grass" was packed into lug boxes. At the end of the day the boxes were gathered up from the washing sheds and hauled to the river bank from where they were shipped down the river by boat during the night to the canneries.

It was thus twenty-four hours after the cutting began before any asparagus found its way into the cans. The stalks had been exposed to hot sunshine for a part of that time and to a hot, dry atmosphere for the remainder. They were reduced from crisp, tender, succulent spears to limp, tough, wilted, bitter ones and these went into the cans. Formerly, when canned asparagus was rare enough to be a luxury regardless of its quality, this method was accepted, but as the bearing acreage and the annual pack increased it became apparent that more

attention would have to be given to methods of handling in the field. Moreover, to be sure of the quality of "grass" received at the cannery, very close control and inspection of growing and harvesting conditions would be required. To do this with the least friction and litigation it became necessary for the canner to become a grower as well. At the present time the two largest asparagus canners in the delta region grow their own asparagus for canning purposes on ranches comprising about 4,000 acres in extent.

Speedy Handling Characterizes Present Methods—With the crop from this acreage at their disposal the next problem was to decrease the time between cutting and canning, and at the same time get a cleaner product to put into the cans. It is, of course, a cardinal principle of most vegetable canning processes that the shorter the time between the field and the can the higher the quality of the pack. This is particularly true of asparagus where the wilting process that takes place after cutting renders the spears bitter and gives them a toughness which cannot be removed by subsequent wetting.

As finally worked out, the asparagus gets into the can on the same day on which it is cut; clean, tender and of quality higher than was ever thought possible under the old methods. In the field, the sled boys are made to follow closely after the cutters so that the spears of grass are not exposed on the hills for more than a few minutes. When the sled is full, instead of hauling it to a field wash shed, he deposits it alongside the road and goes back for another load. Motor trucks make frequent circuits of the ranch roads and load the sleds onto the truck by means of a small derrick operated by the truck motor. Two men operating the truck rapidly load it with about six sleds and quickly haul them to the river landing and unload them at the central wash shed, where there is ever an abundant supply of fresh water.

At the wash shed the sleds are sluiced thoroughly with a hose to remove any superficial dirt. A workman gathers up the stalks from the sled and feeds them to a mechanical washer. The washer consists of a pair of large mesh metal web conveyors of La Porte belt, a rotary knife and several powerful water jets above and below the belts. The asparagus is fed in at one end with the tips always facing the same direction and placed flush against a white rubber belt moving at the same speed as the conveyor. The feeding end is an extension of the

Unloading the sleds by derrick at central wash sheds on the river bank

Loading a boat with washed asparagus. The drag conveyor either elevates or lowers the lug boxes

lower La Porte belt on which the spears are placed but as they approach the knife the upper belt presses them firmly down and the layer of spears, three to six deep, is guided against the knife which cuts about 2 inches off the butt and leaves them uniformly 7 inches long. After passing the knife the asparagus is washed by a series of powerful jets of water and emerges from the washer, snow-white and glistening, to be packed into lug boxes. Forty to fifty pounds are placed in a lug. These are carried down a conveyor and stowed on the deck of a launch in the river below. The portion cut off the butt end of the spears is useless and is dropped into the river.

This method of centralized washing produces a far cleaner product than was ever possible under the old method even when optimum conditions prevailed. The asparagus is fresh from the fields and is so crisp and tender that it snaps clean across when broken with the fingers. No further washing at the cannery is necessary. The cost of both methods is about the same but the added quality and cleanliness of the machine-washed asparagus renders it by far the better product.

The boat, carrying a thousand lugs or more, when loaded, starts its trip down river to the cannery which it reaches in about 2½ hours in the case of the cannery visited. A cannery located at Pittsburg, Calif., is on the banks of the river with the grading and sorting departments built out over the river on piles, a method of construction that simplifies the waste disposal problem tremendously. The lugs are unloaded from the boat onto a conveyor which delivers them to a scale for weighing, from which they are trucked to the grading tables. Weighing is done on a platform scale, four boxes or one truckload at a time. As the boxes come from the boat one out of each 50 is set aside for a grading test. This box is gone over carefully for cull and low-grade spears and the results used as a check against the actual amount packed from the entire shipment.

At the grading tables the spears are graded by hand for color and size. Five sizes are recognized. The operator places the graded pieces in open-top boxes with one side removed. The butts are placed toward the open side of the box. On the other size of the box is a slot which fits over a track alongside a drag chain conveyor. Each box has a distinctive mark on the side corresponding to the grade. When the grader fills the box it is removed, placed on the drag conveyor and replaced with

a similarly marked empty one. As the filled boxes on the conveyor reach the end of the grading table they are seized by an operator who holds the asparagus down with a wooden block and pushes it against a rotary knife which once more cuts off the butt ends. The amount of cut-off depends on the grade and can size and is governed automatically by the position of the slot on the bottom of the box. Ordinarily, this will vary from 2 inches to half the length of the stalk. The cut ends drop down chutes into the river while the tips are tossed into wicker baskets preparatory to blanching.

Peeled, canned asparagus, for which a moderate demand exists, is made from the very large stalks. Peeling is a hand operation carried out with the aid of a knife equipped with a guard so that only the epidermis with very little of the flesh is removed. A certain proportion is also canned ungraded as to size, though a distinction is made between white and green tips. Crooked stalks and excessively small ones as well as others not considered suitable for canning whole are cut into pieces about an inch long and canned as soup cuts. Small green tips from fields near the close of the bearing period are also canned as soup stock.

Up to the present no wholly satisfactory machine has been developed for grading asparagus for size. The one now in use consists of a slot chain conveyor on a table, in which the stalks are placed by hand and which carries them against a stationary knife. The butts to be discarded drop into a chute leading into the river and the tips fall into an elevator boot which carries them up and discharges them onto the top of an oscillating inclined conveyor consisting of six lengths of rubber hose on moving pulleys. The oscillations shake the tips lengthwise into the grooves between the lines of hose and the conveyor carries them down onto the grading conveyor. The grader consists also of six lengths of rubber hose on movable pulleys with the pulleys placed close together at the loading end and farther apart at the discharge end. As the tips are carried forward by the gradually diverging hose-belts they drop between the lines of hose into hoppers as the openings between the lines of hose increase. Theoretically it might be supposed that as close a grading for size as could be desired might be obtained by this device. Practically, however, if the stalks are slightly bent or if they fall otherwise than exactly between the moving lines of hose they are not graded properly. Most canned asparagus is still graded by hand.

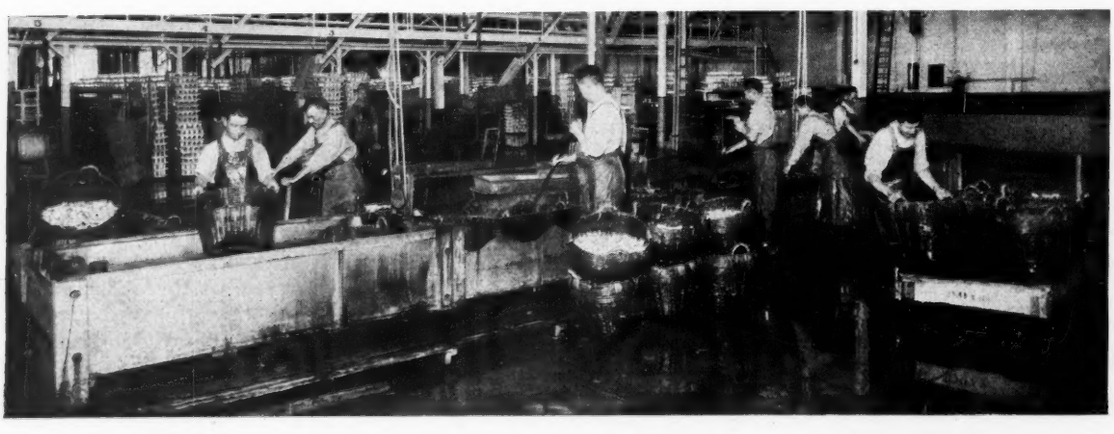
Wicker baskets containing the tips are blanched by immersing in boiling water for 2 to 5 minutes, depending on the size, or until the spears are wilted and flexible. Blanching also removes some bitter principles and mucous-like substances from the asparagus. The baskets are then immersed in cold water and carried to the canning tables.

At the canning tables the asparagus receives a final washing in cold water before being placed in the cans. This washing removes bits of sand which may have been imbedded under the leaf-like buds at the tips for blanching expands these buds slightly and the dirt is easily removed. Fresh asparagus stalks are such tender, brittle vegetables that the vigorous washing given the blanched stalks—exactly like washing clothes on an old-fashioned washboard—is somewhat astonishing at first. Inaccuracies in grading, both of color and size and irregularly cut tips, are corrected before placing in the cans. Most of the pack goes into square cans, since the sides of these will curve inward slightly after cooling and thus hold the stalks tightly in place. Round cans are used for small sizes and for soup cuts.

The filled cans are brined, exhausted and sealed by standard methods and machinery. The use of square cans requires a special sealing machine for handling them. After sealing they are placed in a retort for 30 minutes at 240° F. to insure that no *B. botulinus* spores survive. The retort temperatures and time of operation are checked by representatives of the state health department and any lots processed at lower temperatures or for less time than is required by law are not released until the absence of botulinus toxin has been proved.

The asparagus canning industry is interesting because the improvements in the quality of the finished product have come chiefly through improved field methods before the asparagus reaches the cannery. In other words, factory control methods have been carried back a step from the cannery into the fields. The cannery methods are essentially unchanged. The fact that asparagus is a long straight stalk means that each stalk must be handled individually at least twice during the canning operations and in small bunches of stalks many times. The high percentage of waste in this vegetable is also worthy of note. Practically 50 per cent of the spear as it is cut in the field is waste. No means of utilization of this waste have been found up to the present time. Field methods of handling asparagus appear to be well nigh perfect and doubtless as the necessity for them arises, cheaper methods of cannery handling tending to eliminate the hand operations now in use will be devised.

Acknowledgments are gratefully made to F. J. Mullins, production manager; Langley Brooks, ranch superintendent, and to Messrs. M. T. and M. P. Galvin, plant superintendents, all of F. E. Booth Company, for the information contained herein and for the privilege of visiting the Booth Company ranches and plant, and to the California Packing Corporation for photographs.



The usual method of blanching in wicker baskets in open tanks

ABSTRACTS · OF · CURRENT · LITERATURE

PASTEURIZING. J. M. Sherman and C. N. and Pauline Stark. *Journal of Dairy Science 12,* 385-93; September, 1929. The age of bacterial cells is a factor in the effect of pasteurization on milk which has not been duly considered by investigators of pasteurization problems. It is a known fact, of which practical applications have been made in other lines (including fermentation, cheese making, etc.), that young cells are more sensitive to heat than old cells of the same organism. Thus, a milk with a high bacterial count, in which cell growth has been active, will easily show an efficiency of 99 per cent or more in pasteurization, whereas one with a low count, in which growth has been checked, will show a much lower efficiency. Age is, of course, only one factor in the efficiency of pasteurization, and percentage efficiency is not a proper criterion of the practical benefit of pasteurizing; but it is still true that the age of bacterial cells in milk to be pasteurized has an important bearing on the practical aspects of the treatment. For instance, it was shown, with two varieties of ropy milk organisms, that pasteurization freed the milk from this contamination if the cells were young, but could not be depended upon if the cells were old. On the basis of these experiments, it is also considered proper to urge study of the effect of age of the cells on the relative thermal death rates of the disease-carrying bacteria which are sometimes encountered in milk.

* * *

RENNET. F. Chemitius. *Chemiker-Zeitung 53,* 705-6; Sept. 11, 1929. Calf stomachs for rennet manufacture should be light colored, sweet-smelling, free from spots due to catarrhal and other infections, and lean; fatty stomachs are generally from older calves, not exclusively milk-fed. Drying is best effected by inflating the stomachs and hanging them in a well ventilated, moderately warmed room. For the extraction, a tinned copper kettle is suitable. The temperature must be known and controlled, both in the water bath and in the extractor. A diagram is shown of a complete extraction layout. No iron should be allowed to come in contact with the rennet or its solutions; rust spoils the ferment. Tin should be used for all piping. In Germany, the brine for extraction is made up with salt which has been denatured, under direction of the government inspector, with spent liquor from a previous extraction. As a preservative, boric acid is added to the brine; or if the product must be free from boric acid, alcohol is used. Preservation is also improved by adding to the extractor a solution of thymol in clove oil. The dried rennet powder may have a strength of 1:250,000 or 1:300,000; this is reduced, by mixing with salt in a stoneware ball mill, to the required strength. The salt must not contain over 0.3 per cent of magnesium. The powder is generally made up in strengths varying by gradations of 5,000, from 1:60,000 up to 1:100,000; the extract is made up to 1:11,000 or 1:16,000. Tests for the activity of the ferment are described.

* * *

REFRIGERATOR CARS. E. A. Sweeley. *Refrigerating Engineering 18,* 67-70; September, 1929. The development of refrigerator car design is traced, from the first refrigerated shipment of strawberries from Cobden, Illinois to Chicago in 1865 to the present time. Design followed the theory of the ice refrigerator, modified when required by experience or service conditions. Progress was accelerated in 1918 when the U. S. Railroad Administration formulated some essential principles, supported by tests made by the Department of Agriculture. Major problems include protection of the insulation from moisture, since insulating materials are porous and absorbent; proper support of insulation in place; waterproofing of floors; roof construction to provide both heat insulation and protection from dirt and cinders; and effective draining away of the water from the melted ice. As yet no thoroughly satisfactory waterproofing system for car floors has been developed, and it is probable that no standard will be generally recognized for some time to come. Mechanical refrigeration for freight cars has received much consideration, but cannot compete in cost with ice refrigeration.

* * *

MAYONNAISE EQUIPMENT. Albert K. Epstein. *Oil & Fat Industries 6,* No. 10, 12-3; October, 1929. Mayonnaise and other salad dressings, in common with edible fats in general, are susceptible to oxidation (rancidity) but have an "induction" period of extremely slow oxidation before rapid deterioration sets in. Hence the manufacturer's problem in improving the keeping quality of mayonnaise is to prolong the induction period. In this connection, attention should be given to the equipment in which the product is made or processed, because traces of some metals greatly accelerate oxidation and shorten the induction period. Of metals commonly used in plant equipment, copper is the worst offender, being active in concentrations as small as 1:100,000. Iron has a similar but smaller catalytic effect on the development of rancidity. Tin is harmless, and so is aluminum if used only with cold material. Salad dressings should not come in contact with iron or copper, because the acidity is always high enough to dissolve harmful quantities of the metal. Manufacture and processing should be in tinned or thoroughly enamelled or glass lined apparatus; or in aluminum for cold processes. These precautions are particularly necessary with the newer cooked dressings in which more vinegar is used than in older recipes. It should be noted that rancidity lessens or destroys the vitamin potency of edible fats.

* * *

GRAPE SIRUPS. D. S. Glenn. *Fruit Products Journal 9,* 37-8; October, 1929. Good quality sirups, both for table and industrial uses, can be made from cull grapes (ragged bunches or crushed berries) provided they are not moldy or starting to ferment. The preferred procedure is to crush the grapes with bronze rolls and press them in rack and cloth presses, collecting the juice in wooden tanks (iron tends to darken the juice). For red juice, red grapes should be used and the pulp should be pressed hot, since the red pigment is soluble in hot water. For white sirup the juice should be heated to 175° F. to coagulate proteins and suspended matter, filtered, decolorized with charcoal if necessary, and concentrated. Production is reported of three varieties of grape sirup by these methods: a decolorized, partially de-acidified sirup from Thompson seedless grapes; a raisin sirup made by hot extraction of mixed Thompson and Muscat raisins; and a blend of juices from Thompson and Muscat grapes. All were made up to a density of 68°. Balling. These sirups do not have the viscosity of the heavy corn or sugar sirups; but there is as much consumer demand for the relatively thin as for the thick sirups. Artificial flavors can be used; but for table use a muscat flavor is preferable. For industrial sirups (for bottlers and bakers) Tokay culls were successfully used.

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CAROTIN IN FLOUR. C. G. Ferrari and C. H. Bailey. *Cereal Chemistry 6,* 457-82; 1929. Natural bleaching of flour (by atmospheric oxidation of carotin) has been studied by storing the flour in air at 0° C. and in carbon dioxide at room temperature, a control being stored under ordinary conditions. Low temperature had considerable retarding effect on the bleaching; but carbon dioxide had very little effect, perhaps because the flour particles held air trapped within themselves. The carotin content was measured by determining the transparency of the gasoline extract of the flour to light of known wavelength. Further experiments were made with artificial bleaching methods, including ultra-violet light and various chemical bleaching agents. Tables and curves are shown, indicating the effect of these treatments on the carotin content (gasoline extract transparency) of the flour. In chlorine bleaching, most of the effect is accom-

plished at once but slower bleaching continues for a long time. This settles a point about which there has been much difference of opinion. Nitrogen trichloride (Agene process) gave 96 per cent bleaching effect, which is more thorough than chlorine bleaching. Beyond a certain amount, further additions of nitrogen trichloride increased neither the rate nor the thoroughness of bleaching. Benzoyl peroxide gave about 60 per cent bleaching effect, which is less than with chlorine. Ultra-violet light gave 47 per cent bleaching effect in seven hours. No experiments were made with nitrogen peroxide (Alsop process).

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MOISTURE IN WHEAT. Thomas H. Fairbrother. *Cereal Chemistry 6,* 379-95; September, 1929. Among the problems in the important matter of moisture in wheat and flour still needing elucidation are the equilibrium relations between moisture in the air and in flour, the weight changes in different atmospheres, and the interchange of moisture between different wheats stored together. In a series of experiments lasting fourteen months, 3-pound bags of flour lost as much as 4 per cent in weight in hot, dry weather and gained as much as 2.2 per cent in cool, wet weather. Contrary to opinion in the trade, no significant difference was observed in the weight changes of flour in cotton and in paper bags. In the equilibrium experiments, it was observed that a bag of flour, when exposed to a known high humidity until equilibrium was reached and then to a much lower humidity, would never regain all of its original weight when the original high humidity was restored. It is concluded that the drying process has a permanent effect, apparently gelation of some of the particles, which lessens the hydration capacity of the flour. This may have an important bearing on the commercial conditioning of flour. Many millers, in following the practice of controlling moisture content by mixing a wet with a dry wheat, believe that the interchange proceeds to equality. Some allow as much as fourteen days, others much less. Experiments with various pairs of wet and dry wheats indicated that equilibrium is reached in about three days, but not at equality of moisture content. Pairs which differed in moisture content by 5.2, 6.2, 8.8, 4.7 and 5.7 per cent still showed differences of 1.6, 2.0, 1.8, 1.9 and 2.4 per cent when the interchange was completed.

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COPPER IN MILK. J. Miscall, G. W. Cavanaugh and P. P. Carodemos. *Journal of Dairy Science 12,* 379-84; September, 1929. The solubility of copper (from copper containers) in raw and pasteurized milk is less dependent on oxygen than has been reported by previous investigators. Raw milk contains more oxygen than pasteurized milk, but dissolves less copper under like conditions. Other experimental observations also indicate that part of the solubility of copper in milk is due to a reaction over which oxygen has no control. Quam and his co-workers reported a maximum in the solubility-temperature curve at about 85-90 deg. F.; in this investigation a regular increase in solubility was observed up to about 140 deg. F., followed by a decrease. The copper-dissolving power of milk can be lessened either by removing the dissolved gases or by adding carbon dioxide. Heating milk for 2 hours, above the pasteurizing temperature, in contact with bright copper also lessens the dissolving power, apparently by a reaction in the milk serum. The experimental data are presented in tables and curves.

* * *

CONTROL OF SPOILAGE IN TOMATO PRODUCTS. Carl S. Pederson and Robert S Breed. *New York State Agricultural Experiment Station Bulletin No. 570.* August, 1929. Studies have shown that with very few exceptions spoilage is caused by bacteria belonging to the lactic acid types. A few yeasts and spore-forming bacteria occur, but cause little trouble in these products. The lactic acid bacteria ferment the sugars present and produce lactic and acetic acids, carbon dioxide, alcohol and mannitol. None of these products are poisonous, but they produce disagreeable flat and sour flavors. In some cases the product may be slimy, but this sliminess is not poisonous. With very few exceptions, the organisms are not resistant to the heat ordinarily used in canning. Losses are caused by carelessness in cleaning and sorting tomatoes; by improper methods of operating machinery used in canning and bottling, particularly where hot products are placed in containers that are not afterward re-sterilized. The use of five gallon cans for storage of tomato pulp was also the cause of much loss.

* * *

LEMON PASTES. Beniamino Melis. *Giornale di chimica industriale 11,* 399-404; September, 1929. The American practice of working up lemon pulp and skins for pectin was deemed insufficient as a system of by-product recovery, and a study of other possibilities was made on behalf of the Sicilian lemon industry. The results indicate the advisability of recovering an acidulated glucose extract from the pulp paste, a bitter glucose extract from the skin paste, and from both pastes fats, nucleoproteins, pectin and cellulose. The major steps in the process are drying, alcoholic extraction, and working up the extracted residue for pectin and cellulose. On account of the heat-sensitivity of pectin, the pastes should be vacuum dried. The weight loss is about 80 per cent. For the sake of obtaining two different glucose extracts (acid and bitter), the skin and pulp pastes should be extracted separately with alcohol. The residual pectocellulose amounts to about 9 per cent of the pulp paste and about 15 per cent of the skin paste. The flocculent precipitate obtained when the alcoholic extract is concentrated amounts to about 0.6 per cent of the fresh pastes and contains fat and nucleoproteins. For working up the pectocellulose residue, American practice was considered unsatisfactory and a method was worked out by which the residue is treated with chlorine water and the pectin is precipitated by adding aluminum chloride. The final residue of cellulose is obtained in a form which swells in water and dries to a hard, horny material which can be worked and painted much like wood.

* * *

CITRUS PRODUCTS. *Bulletin of the Imperial Institute 27,* 322-38; October, 1929. The Imperial Institute has prepared a comprehensive memorandum for the Empire Marketing Board on commercial products from citrus fruits. The major items are citric acid and its salts, raw and concentrated juices, and essential oils. Lemons are used for making these products to a greater extent than limes and oranges. The pineapple (juice and cannery wastes) is becoming a competitor of the citrus fruits as a source of citric acid. The principal producing areas are southern Italy, California and the West Indies. The essential oils produced from citrus peels include lemon, lime, orange, bergamot and mandarin oils. Export data for several producing regions are tabulated. As an appendix to the memorandum, a description is given of the manufacture of citrate of lime from lemons or limes and whiting.

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PRODUCTION POINTS ON SLICED BREAD. A. F. Gerhard, *Northwestern Miller and American Baker,* vol. 6, page 297, Oct. 23, 1929. In the final analysis, the increase in sales of this product will be enjoyed by the man who turns out the best product. Very important items that need close watching are: formula, fermentation, loaf make-up, baking, cooling, slicing and wrapping, and cost of slicing. Cooling and slicing are often sources of mold infection. Photographs illustrate moldy and crippled bread.

* * *

IRRADIATED FOODS AND IRRADIATED ERGOSTEROL. Katharine Blunt and Ruth Cowan, *Journal of the American Medical Association,* vol. 93, page 1301, Oct. 26, 1929. Sugar is almost the only natural food for which attempted irradiation has been unsuccessful. Various irradiated foods may be an important contribution to national health. Irradiated ergosterol and dangers of very large doses are discussed as well as its physiological effect on the body. The use of such a potent substance necessitates careful standardization of the material before it is used.

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GERMAN MILL USES ULTRA-VIOLET RAYS ON FLOUR. *American Miller,* vol. 57, page 1078, Nov. 1, 1929. Mill products are exposed to the ultra-violet rays to produce a low-cost food which abounds in the antirachitic vitamin D. Other changes occur simultaneously with this treatment and give better baking qualities and a more wholesome taste. Compared to milk, flour and flour products have the advantage of greater constancy, a lower content of germs, and much better keeping quality.

· CRITICAL · BOOK · REVIEWS ·

VARIATIONS IN WHEAT PRICES. By A. E. Taylor. Wheat Studies of the Food Research Institute, Vol. V, No. 7, June 1929, Stanford University, Calif. 60 pages. Price, $1.50.

IN THIS non-technical discussion of wheat price variations for the past 30 years, the author defines the various significant types of wheat price variation; illustrates the amplitude of movement in each type of variation; indicates the influences to which variations occurring in pre-war years with those occurring in post-war years. Because of the fact that the price of wheat at any time is not a point but a wide range, a good deal of uncertainty necessarily surrounds any attempt to describe and measure wheat price fluctuations, and to point out the principal causes of variation. The present study emphasizes certain characteristics of wheat-price movements which seem to require attention whenever wheat price stabilization is discussed.

* * *

THE EXPORT DEBENTURE PLAN FOR WHEAT. By Joseph S. Davis. Wheat Studies of the Food Research Institute, Vol. V, No. 8, July, 1929, Stanford University, Calif. 46 pages. Price, $1.

AS IS fairly well known to all who follow the activities of Congress, the farm export debenture scheme is an ingenious proposal designed to supplement our protective tariff by a system of export bounties on farm products of which we produce export surpluses. The present analysis of the plan, as it might be applied to wheat and flour, leads to the conclusion that the results would be highly disappointing. It is the opinion of the author and his assistants that, even in the early stages, farm prices of wheat would be raised by less than the debenture rate.

Under the stimulus of expected and realized price increases, production would expand. Consequent expansion of exports would cause declines in world prices, thereby minimizing the enhancement of domestic prices. Ensuing readjustments in acreage, here and abroad, would lead to an equilibrium in which price benefits to American wheat growers would be only moderate, even in the absence of foreign retaliation. Some reprisals are likely; and so far as these materialized, they would reduce the farm price enhancement otherwise possible. Higher prices to farmers as consumers, substantial costs to the Treasury, disturbances to agriculture, industry, and trade, and international complications would tend to offset the gains from limited increases in farm prices.

* * *

WHEAT UNDER THE AGRICULTURAL MARKETING ACT. By A. E. Taylor. Wheat Studies of the Food Research Institute, Vol. V, No. 9, August, 1929. Stanford University, Calif. 79 pages. Price, $1.50.

THIS is a study of some of the problems that confront the Federal Farm Board. The opening pages point out that the Agricultural Marketing Act constitutes an innovation in national policy, in that it embodies recognition of the desirability of maintaining reasonably comparable progress in agriculture and industry.

Urban industry has undergone reorganization with resultant rationalization of production methods. The outstanding problem facing urban industry is to introduce into the system of distribution an efficiency comparable to that existing in the methods of manufacture. In the judgment of the authors, agriculture probably is as efficient in production as is urban industry, distribution of agricultural products remaining inefficient.

In the Agricultural Marketing Act are envisaged a reorganization of cooperative marketing and a rationalization of the processes of distribution. Wheat is one of the most important crops and is prominent in our export trade. Wheat growers have suffered both general and special disabilities. On the basis of existing information, the authors have made a tentative appraisal of the reorganization of wheat production and trade under the act.

· GOVERNMENT · PUBLICATIONS ·

Documents are available at prices indicated from Superintendent of Documents, Government Printing Office, Washington, D. C. Send cash or money order; stamps and personal checks not accepted. When no price is indicated pamphlet is free and should be ordered from bureau responsible for its issue.

Dairy and Poultry Statistics, compiled by C. L. Harlan and others. U. S. Department of Agriculture Separate 1030 from 1928 Yearbook.

Vitamins in Food Materials, by Sybil L. Smith. U. S. Department of Agriculture Circular 84. Fifteen cents. Gives table on relative distribution of vitamins in certain foods by classes and contains a reference list reporting occurrence of the vitamins.

Commercial Cuts of Meat, by W. C. Davis. U. S. Department of Agriculture Department Bulletin 300. Five cents.

Sauerkraut, by E. A. Martin and others. Reprinted from the Journal of Agricultural Research of the U. S. Department of Agriculture, Vol. 39, No. 4; Aug. 15, 1929. Discusses relation of temperature of fermentation to quality of sauerkraut.

Vitamin Content of Honey and Honeycomb, by Hilda B. Kifer and Hazel E. Munsell. Reprinted from the Journal of Agricultural Research of the U. S. Department of Agriculture, Vol. 39, No. 5; Sept. 1, 1929.

Pacific Coast Oyster Industry, by Paul S. Galtsoff. Bureau of Fisheries Document 1066. Fifteen cents. Issued as Appendix VIII to Report of the U. S. Commissioner of Fisheries for fiscal year ending 1929.

Fishing Grounds of the Gulf of Maine, by Walter H. Rich. Bureau of Fisheries Document 1059. Twenty-five cents. Issued as Appendix III to Report of the U. S. Commissioner of Fisheries for fiscal year ending 1929.

Alaskan Fishery Industries in 1928. Bureau of Fisheries Document 1064. Twenty-five cents. Issued as Appendix VI to Report of the U. S. Commissioner of Fisheries for fiscal year 1929.

Regulating Milk, by Harvey Walter. U. S. Public Health Service Reprint No. 1240, from Public Health Reports of Aug. 10, 1928. Five cents. Describes activities of the Service in regulating production, handling, and distribution of milk.

Fumigation With Cyanogen Products, by C. V. Akin and G. C. Sherrard. U. S. Public Health Service Reprint No. 1250, from Public Health Reports of Oct. 12, 1928. Five cents. Report of experiments conducted with cyanogen products used in the fumigation of vessels for quarantine purposes at the New York Quarantine Station, Rosebank, Staten Island, N. Y.

Irradiated Ergosterol, by Maurice I. Smith and E. Elvove. U. S. Public Health Service Reprint No. 1285 from Public Health Reports of May 24, 1929. Five cents. Describes action in rabbits.

Sanitary Engineering, by Isadore W. Mendelsohn. U. S. Public Health Service Reprint No. 1273, from Public Health Reports of March 22, 1929. Five cents. Deals with sanitary engineering courses of engineering colleges of the United States.

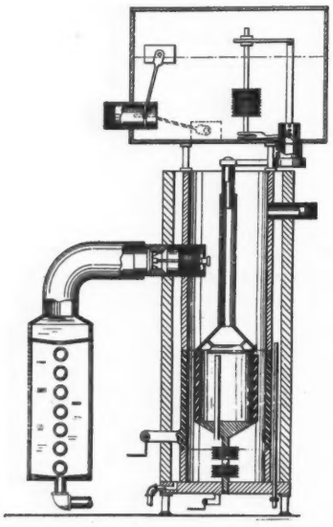
Food Production Statistics. Printed pamphlets from Census of Manufactures, 1927, on: Canning and preserving; chocolate and cocoa products, confectionery, and chewing gum; the sugar industries and corn sirup, corn oil, and starch; and slaughtering and meat packing and related industries. Five cents each.

Harvesting Grain Sorghums, by John H. Martin and others. U. S. Department of Agriculture Technical Bulletin 121. Ten Cents.

Keeping Quality of Butter, by William White and others. U. S. Department of Agriculture Technical Bulletin 159. Five cents. Gives particular attention to effect of cream acidity.

· SELECTED · PATENTS ·

Electrical Sterilization — Harry B. Rudd, Mansfield, Ohio, to Electropure Corporation, Detroit, Mich. No. 1,730,016. Oct. 1, 1929—Heat for sterilization of liquids is generated by the passage of current through the liquid between electrodes. The liquid is passed directly from the sterilizer to the container without exposure. A heat ex-



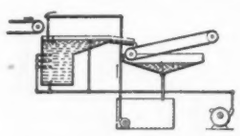
changer utilizes the sterilized product to preheat the incoming liquid. "Thermodynamic" controls regulate the rate at which the material enters the chamber, the amount of current passing between electrodes, and the rate at which the liquid leaves the sterilizer, giving a close and positive regulation of sterilization.

* * *

Egg-Yolk Product — Albert K. Epstein, Chicago, Ill., to Emulsol Corporation, Chicago, Ill. No. 1,730,879. Oct. 8, 1929—For some purposes it is desirable to have an egg-yolk product with a viscosity suitable for emulsification with oils and fats. Commercial egg-yolk is treated with a neutral edible salt, such as sodium chloride, and the product when frozen and thawed out has a viscosity greater than unfrozen untreated yolk, but less than untreated yolks that have been frozen and thawed. Two to eight per cent of salt is suitable.

* * *

Fruit Washer—Albert Burch, of Medford, Ore., and Lloyd C. White, of Berkeley Calif. No. 1,724,639. Aug. 13, 1929 — Fruit washing apparatus, as shown in drawing, which provides for agitation of the fruit, suitable drying,



and draining. Wherever spray residues adhere to the fruit, such as apples, the washing solution is dilute hydrochloric acid.

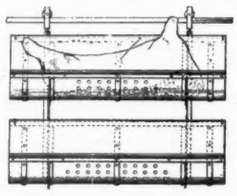
Preparing Lactic Salts From Whey—Sanford K. Robinson, Chicago, Ill., to K-P-C Company, Chicago, Ill. No. 1,726,768. Sept. 3, 1929—Preparation of lactic salts from waste products of the dairy industry, and the use of these salts as a fluxing ingredient in the manufacture of processed cheese. After fat has been removed from whey, it is inoculated with an organism for producing fermentation. As fermentation proceeds, milk sugar is converted into lactic acid, which is then neutralized by the addition of an alkali, such as sodium hydroxide. It is then evaporated under vacuum at a temperature below 160 deg. F., causing a precipitation of casein and albumin which is then filtered off. The sirupy solution of sodium lactate which remains is used for the emulsification of cheese, 1½ to 2 lb. of the 65 per cent sirup being used for each 100 lb. of cheese.

* * *

Preserving Fruit—Samuel E. Oliver, Galveston, Texas. No. 1,729,893. Oct. 1, 1929—Fresh fruit is cleaned and chilled to a temperature of about 34 deg. F. Meanwhile, granulated sugar to be used in packing the fruit is also chilled, to a temperature of about 30 deg. F. The bottom of an airtight container is then covered with a layer of sugar and the container packed with alternate layers of precooled fruit and sugar, care being taken to see that the pieces of fruit do not come into contact. The container is then closed and hermetically sealed.

* * *

Beef-Chilling Rack—John E. Covey, of Chicago, to Swift & Company, of Chicago. No. 1,724,006. Aug. 13, 1929—



A method of handling beef for chilling to avoid the usual hanging from hooks and consequent distortion of the carcass.

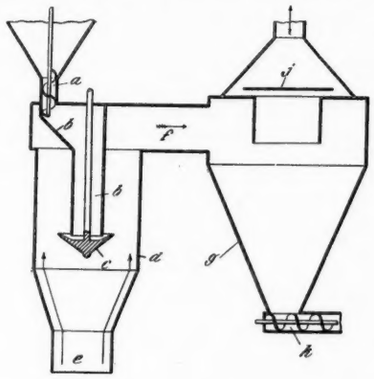
* * *

Making Beer Yeast into Food—Maurice Kahn, of Paris, et al. to Société Française des Produits Alimentaires Azotes, of Paris. No. 1,724,027. Aug. 13, 1929—Hidden under the title "Process for Industrial Use of Inferior Vegetables," this patent describes a method of converting beer yeast into suitable food for animals or humans by autolysis and subsequent treatments.

* * *

Manufacture of Gluconic Acid from Sugars—Horace T. Herrick and Orville E. May, of Washington, D. C., to the People of the United States. No. 1,726,-067. Aug. 27, 1929—Another possible use for sugar is found in the ability of certain molds of the *Penicillium* group to manufacture gluconic acid from glucose or sucrose.

Heat-Treating Flour—E. A. Fisher and C. R. Jones, St. Albans, England. No. 1,727,429. Sept. 10, 1929—To improve the baking qualities of flour it is heat-treated, when in cloud form, by being subjected to a current of air which will raise the temperature of the flour to 130 to 180 deg. F. without substantial loss of moisture. As shown in



the drawing, flour is passed from a conveyor, *a*, down a chute, *b*, to a disk, *c*, which rotates rapidly in a chamber, *d*, so that the flour is flung out in a thin cloud by centrifugal force. A stream of heated and humidified air entering at *e* is driven upward at such a velocity as to carry the flour with it. The air and flour are separated in the chamber, *g*, the air passing out through textile fabric or baffle plates at *j*, where the finest particles are removed. The air may then be recirculated.

* * *

Sterilizing by Pressure Without Heat—David Crowther, Minneapolis, Minn. No. 1,728,333. Sept. 17, 1929—An inert gas, preferably carbon dioxide, is impressed upon the material to be sterilized in a suitable container at a pressure of 800 to 900 lb. per square inch. The bodies of the organisms thus become saturated with the gas. A sudden release of the pressure is said to rupture the living cells of the organism, thus killing them without the application of heat.

* * *

Package for Sliced Bread—Gustav C. Papendick, St. Louis, Mo. No. 1,722,338. July 30, 1929—A method of packaging bread in which it is first sliced, and then placed in an open tray of cardboard so shaped from a single blank that when pressed inward on the end walls, as shown, it can easily be slipped over the sliced load. When the ends of the tray

are released, they automatically take their normal flexed position, gripping the sides of the slices and holding them in position for wrapping in the usual manner.

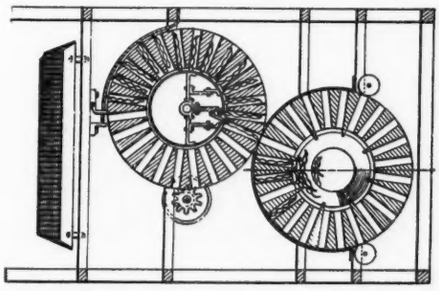
Manufacture of Clear Cereal Beverages—Herman Heuser, of Evanston, Ill., to United States Process Corporation. No. 1,724,021, Aug. 13, 1929—The use of catechu tannic acid to effect a partial precipitation of proteins that might later cause a haze or sediment in the beverage. It is said not to harm the taste, flavor, or foam producing properties of the beverage.

* * *

Heat Treating Flour to Give "Strength"—C. W. Chitty and D. W. Kent-Jones, of Dover, England, to Woodlands, Ltd., of Dover, England. No. 1,710,472. April 23, 1929—A substitute for well-known flour improvers, based on U. S. Patent No. 1,634,259, granted July 5, 1927 to Robert Hutchinson, who found that, when flour is dry-heated to the point at which gluten is non-retainable in a washing test and then blended with original flour, the mixture possesses superior "strength." In this patent flour is dry heated for a considerably longer period than in the Hutchinson patent and at least seven hours at a temperature between 170 and 200 deg. F. is specified. Striking increases in strength of the whole flour can be obtained by the addition of treated flour in amounts as small as 2 pounds per sack of flour.

* * *

Bean Snipper—Roy F. Laughlin, of Elwood, Ind. No. 1,726,032. Aug. 27, 1929—Automatic bean snipper consisting of two cylinders arranged as in the drawings. The beans are fed into the upper cylinder and by tumbling around find their way into the slots in the lower cylinder. Their ends protrude past a



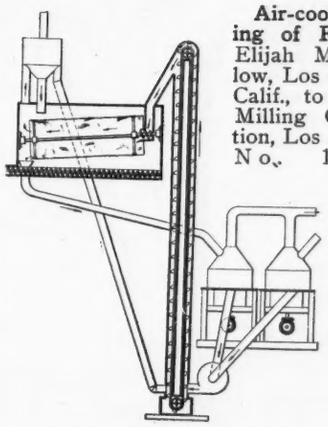
stationary knife which cuts them off when the cylinder revolves. After turning one-half revolution the beans fall out into a receptacle below. Provision is made to avoid long cuts into the beans.

* * *

Bread Testing Apparatus—Robert L. Corby, of New York. No. 1,725,781. Aug. 27, 1929—Another method of testing a volume of a loaf of bread.

* * *

Grading Fruits by Specific Gravity—E. H. Weigand and D. E. Bullis, Corvallis, Ore., by mesne assignments to Citizens of the United States. No. 1,728,583. Sept. 17, 1929—A process for grading fruit which makes use of the variation in specific gravity with degree of maturity. The fruit is placed in a bath having a specific gravity between the juice of the mature fruit and that of the immature fruit, permitting the more mature fruit to sink while the green fruit floats. Successive baths of increasing density of salt solution are used, the green fruit being skimmed off each time.



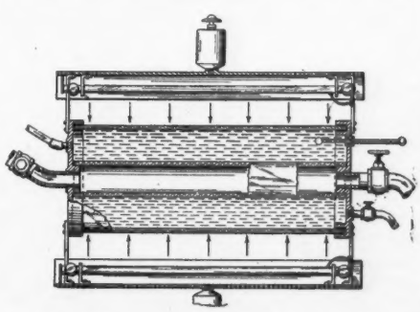
Air-cooled Milling of Flour — Elijah M. Kinslow, Los Angeles, Calif., to Vitimin Milling Corporation, Los Angeles. No. 1,728,184. Sept. 17, 1929—It is desirable to cool the mill and flour products during grinding to preserve, as far as possible, the chemical properties of the grain in its natural state. As shown in the diagrammatic layout, two mills are used; in one the whole grain is ground, and in one the tailings from the bolter are reground, after which they are mixed with the products of the first mill so that they pass through the apparatus together. The air blast produced by the blower is dissipated through the elevator and chute into the bolt casing, or through a tube to the separator in the bolt housing. The air to supply the blower is drawn in through the mills from a cool outside source.

* * *

Maturing Dough More Rapidly—John R. White, Long Island City, N. Y. No. 1,729,409. Sept. 24, 1929—A leavening compound which eliminates almost entirely the period of time ordinarily allowed for the maturing of the dough is made by successively propagating yeast in a series of fermentable liquids, to the last of which has been added a mucic acid compound. Best results are obtained in one variation of the process when 0.05 gram of mucic acid is added for every pound of flour used.

* * *

Activation by Ultra-Violet Rays — Jacques W. D. Chesney, Chicago, Ill., to the Chesney Process, Inc., Chicago, Ill. No. 1,723,603. Aug. 6, 1929—A process of activating food materials by acidifying them to not over 1 per cent with an organic acid, and then subjecting the acidulated mixture to the action of ultra-violet rays of not less than 2,000 A. U. In the case of milk products and like liquids, this process is preceded by pasteurization. One type of ap-



paratus for use with liquids is shown in the figure. The water jacket maintains the proper temperature, and special glass permits passage of rays of desired frequency.

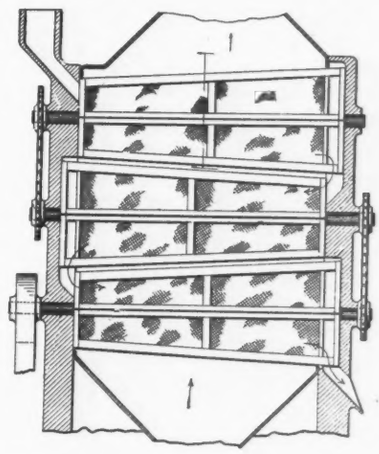
Preserving Egg Yolks and Whites—Joseph Fousek, of San Francisco. No. 1,724,078. Aug. 13, 1929—Either whole eggs, yolks, or whites are mixed with equal weights of sugar and raised to a temperature of from 40 to 60 deg. Reaumur. The egg albumin does not coagulate by this heat treatment, but the bacteria are destroyed.

* * *

Drying Room for Spaghetti—Alexander Gallerani. No. 1,726,661. Sept. 3, 1929—A drying room for spaghetti and similar products which is divided into compartments by vertical perforated double walls. Washed air is introduced into the space between the two walls and is heated by steam pipes or other means between the walls before it passes through the perforations into the room. Air is withdrawn from the floor of the compartments. Control is provided to maintain uniform drying conditions throughout the room.

* * *

Continuous Noodle Drier — Michele Cantella, of Roslindale, Mass., to Prince Macaroni Manufacturing Company, Inc., of Boston. No. 1,722,732. July 30, 1929—A continuous noodle drier, as shown in the cut, in which the noodles are fed



into a hopper at the top of the machine and passed through conical sieves with hot air blowing over them. The sieves are hexagonal in cross-section.

* * *

"Puffing" Foods—Alexander P. Anderson, Red Wing, Minn., to Anderson Puffed Rice Company, Chicago, Ill. No. 1,725,171. Aug. 20, 1929—Formerly only material in the form of pellets could be "puffed." In the process patented, a continuous strip of this porous material is obtained, from an originally compact mass. The original flour mass is subjected to a mechanical pressure between 500 and 5,000 lb. per square inch. The material is then cooked under compression in a group of steam-heated tubes. The strip of material is squeezed through an orifice, and the moisture contained therein flashes into steam and "puffs" the material. The product then passes to a drying chamber. Various types of flours and starch pastes may be so processed, including the pulp of potatoes and green bananas. A variation in the process consists in injecting carbon dioxide into the material in the compression chamber. As the material leaves the orifice, the sudden expansion of the compressed gas aids in the "puffing."

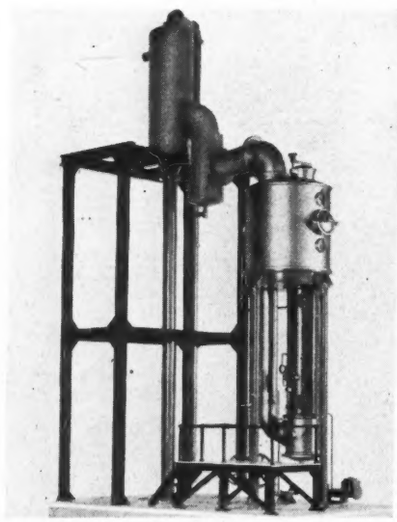
NEW EQUIPMENT

Shown at the Dairy Industry Exposition

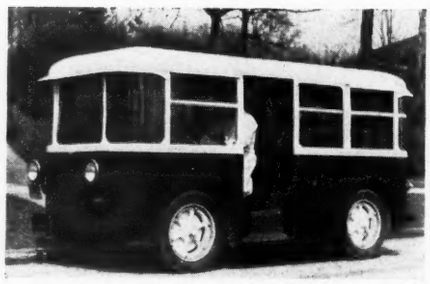
Milk Evaporator of Stainless Steel

A NEW series of "Buflovak" milk evaporators built of stainless steel is now being manufactured by the Buffalo Foundry & Machine Company, Buffalo, N. Y. These evaporators, in which special attention has been concentrated on details of sanitation, are of the vertical, rapid-circulation type with heating tubes and steam chest arranged to further accelerate circulation.

The milk is ejected into the vapor body in small particles, exposing a greater area of the entire mass of milk to the vacuum, a feature which is said



to have a decided influence upon the elimination of objectionable odors which the raw milk may have contained. Boiling over has been eliminated in this design, it is claimed, allowing full-capacity production without interruption in spite of the tendency to foam.



Milk Delivery Unit

A RADICAL departure from the ordinary milk delivery truck has been made by the Twin Coach Corporation, of Kent, Ohio, which has modeled a vehicle for house-to-house distribution along the general lines of its passenger bus. The engine, transmission, and braking have been especially designed for multiple-stop operation.

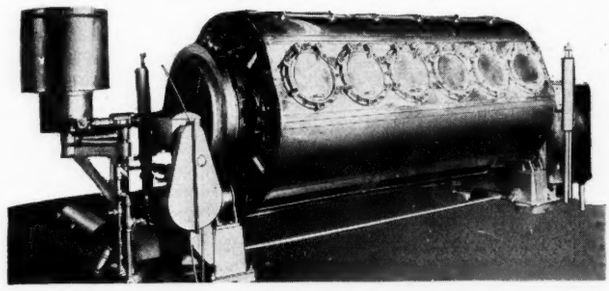
The low platform and the door design make entrance and exit, especially when products are being handled, decidedly more efficient from a time-saving point of view. There are seventeen milk cases open and within reaching distance of the driver at all times. Space is provided for five cases open in front of the driver, thus making his load accessible from either side of the aisle. There is 74¾ in. headroom in the center section of the truck, and its weight is about 3,500 pounds. The unit has a wheelbase of 96 in. Cork insulation for roof and sides of the body is optional equipment.

Helix Holder for Pasteurization

THE HELIX HOLDER, latest addition to the equipment of the Creamery Package Manufacturing Company, Chicago, Ill., for precise pasteurization of milk, is designed to receive the milk at pasteurization temperature from the heater, retain it without loss of heat 30 minutes or more, and then pass it on to the cooling equipment without exposure to the air.

A simple principle not heretofore applied to this purpose, that of a coiled tube which, when rotated, empties itself of the contents of one turn at each revolution, is used in the design. The helical tube, made square to conserve space, is inclosed within a water jacket and an exterior casing insulated with corkboard.

The motor drive is so timed that, when the holder rotates continuously, it requires 30 minutes for the milk to complete its journey through the spiral and to be discharged. The milkway is constructed of Super-Ascoloy and the device is made easy to clean by a number of hinged doors. Problems of foam, milk rings, overheating and evaporation are eliminated.

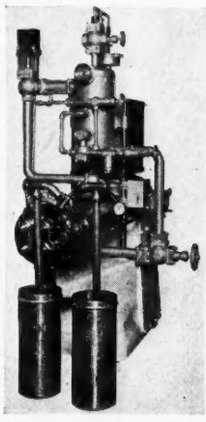


Pasteurizing holder uses helix principle

General View of the Exposition

Faster Freezing of Ice Cream

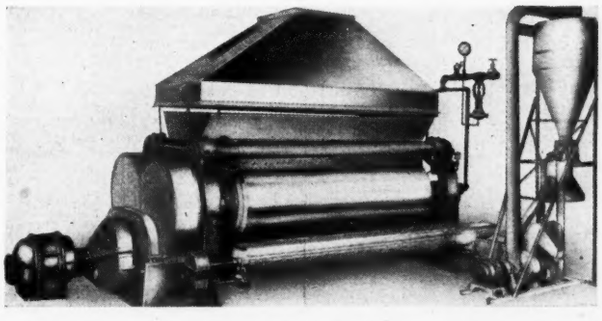
A NEW ice cream freezer developed and exhibited by the Cherry-Burrell Corporation, Chicago, Ill., is equipped with a double plunger pump which feeds the mix, together with a predetermined amount of air under positive pressure, through the barrel of the freezer, where a rapidly turning set of paddles agitates the mix, insuring a maximum exposure to the side of the barrel. Cooling is through the direct-expansion method. The speed of either the pump or agitating mechanization can be controlled to suit any type of mix. The frozen mix is delivered at approximately 24 deg. F. for the hardening rooms. This represents a saving of from 4 to 6 deg. in the final operation. The unit is self-contained, and occupies, in area, about the same space as the older type of freezer having from one-third to one-fourth the capacity. Another saving effected is in ammonia compressor power. Tests indicate a saving of 25 per cent.



Latest type freezer

Milk Dryers Have New Features

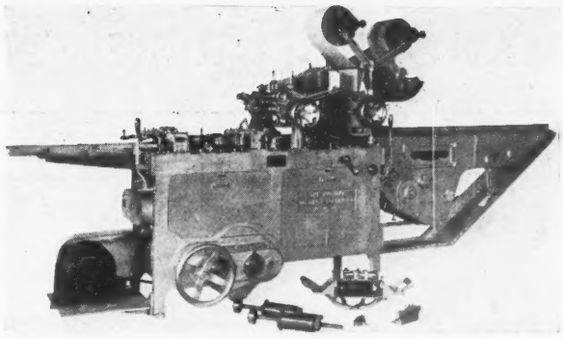
COMPACTNESS and accessibility are combined in the new series of "Buflovak" double-drum dryers, lately placed on the market by the Buffalo Foundry & Machine Company, Buffalo, N. Y. The necessity for an operating platform has been eliminated by the low construction, and operating adjustments have been simplified and their number reduced.



New model milk dryer

The knife-holder assemblies are installed in eccentrics, permitting a 14-degree adjustment in knife angle and position; improved weight distribution enables the operator to raise the knife holders easily. Rigidity of this unit permits uniform tension on the knives without excessive pressure.

A pneumatic elevator delivers the dry milk to a combined grinder and sacker. Power requirements have been lowered through the dryer by the use of roller bearings, cut gears and rigid construction, unit drive consisting of Sykes tooth herringbone gears. Cleaning and lubrication have also been simplified in this new series, of which five models, ranging in size from 24x36 in. to 36x100 in., are available.



One machine does work of three.

Sanitary Connection For Instruments

RECORDING, indicating and regulating instruments are rendered interchangeable on various types of milk lines, vats and glass-lined tanks by the "Four in One" sanitary milk connection which the Taylor Instrument Companies, Rochester, N. Y., are now manufacturing. The elimination of the necessity for a complete set of reserve instruments is accomplished by this fitting, which, without loss of accuracy, adapts the instruments to I.A.M.D. coil vat fitting, I.A.M.D. glass-lined fitting, ¾-in. thread union hub fitting, or sanitary ferrule fitting. The connection is easy to clean and assemble. All parts exposed to milk are chromium-plated.

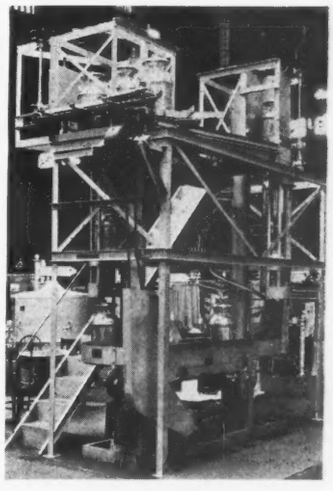
Triple Duty Butter Cartoning Machine

THE Automat "Triplex" wrapping and cartoning machine for butter, a product of the Automat Molding & Folding Company, will individually wrap and inclose in one-pound cartons, either four quarter pounds, two half pounds, or one full pound. Adjustments to handle these three sizes are easily and quickly made. It may also be used for wrapping only.

The capacity of the new machine, based on a test under actual working conditions, is 4,000 pounds per hour for pounds, 2,400 pounds per hour for half pounds, and 1,500 pounds per hour for quarter-pound prints.

In addition to the three-size-print feature, the development of the machine is marked by a greatly improved parchment feeder. Heat-treated aluminum alloy has been substituted for cast steel in the feed ram and other moving parts, the resultant weight reduction making higher speeds possible. All bearings are bronze bushed, and shafts are made either of Monel metal or stainless steel. Cam rollers are of stainless steel, and all metals used in the machine are said to withstand the action of acid, salt water, and constant washing. The machine is powered by a 1-hp. motor.

New Spiral Can Lift And Descender



THESE two units, designed to automatically lower and lift filled or empty milk and ice cream cans, consist of spiral rails wound about a central core which supports the spiral. An automatic timed feeding device places the can in position to start the descent or ascent when the screw is in the proper position to receive it. Cans are also automatically removed and delivered to a drag chain conveyor.

The speed of the two units is variable, but it is possible to handle twenty cans per minute. Approximately 1½ hp. is required to operate a 30-ft. descender and 2 hp. to operate a 30-ft. lift. The illustration shows the descender on the left and the lift on the right, tied together for demonstration purposes. The units can be built to any desired height.

MANUFACTURERS' · NEWS · AND · EQUIPMENT

Horizontal Centrifuge

FEEDING and discharging while at full speed is accomplished in the new bulk centrifuge developed by the Sharples Specialty Company, Philadelphia, Pa. The centrifuge is built in two types, both of which utilize a large-diameter basket mounted on a horizontal shaft.

The decanter type uses a solid basket and vanes are provided in the conical portion against which the incoming liquid, containing solid matter in suspension, is fed near the center. As show in *a* in Fig. 2, the material flows to the periphery, where the solid particles are deposited on the inner basket surface and the liquid is discharged through the skimming nozzle. When

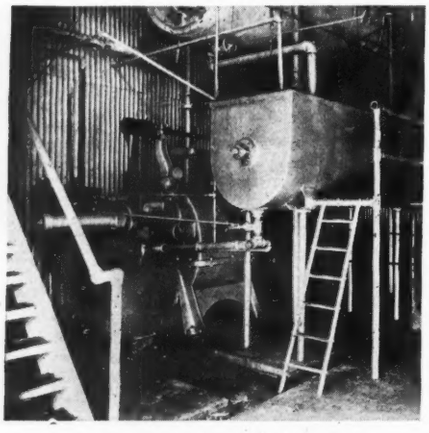


Fig. 1—Centrifuge operating in casein plant

the cake has been built up to the desired thickness, the feed is cut off and the cake removed by the cutter while it is running at full speed.

A perforated basket is used when the centrifuge is to be operated as an extractor and the product is to be dried as shown in *b* in Fig. 2. The slurry flows into the basket by means of a perforated feed pipe or overflow trough. When the cake has reached maximum thickness, it is whizzed and removed by the cutter as before.

The machine is said to have a very high capacity for its size. Fig. 1 shows a centrifuge of this type operating in

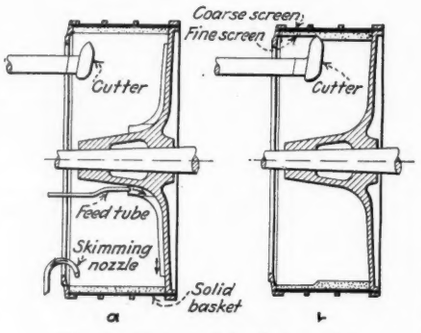


Fig. 2—Types of basket used in horizontal centrifuge

a casein plant. It is available in two models, the smaller, with a 48-in. basket for capacities up to 4,000 gallons per hour, and the larger, with a 63-in. basket, for one to three tons per hour, depending on the materials.

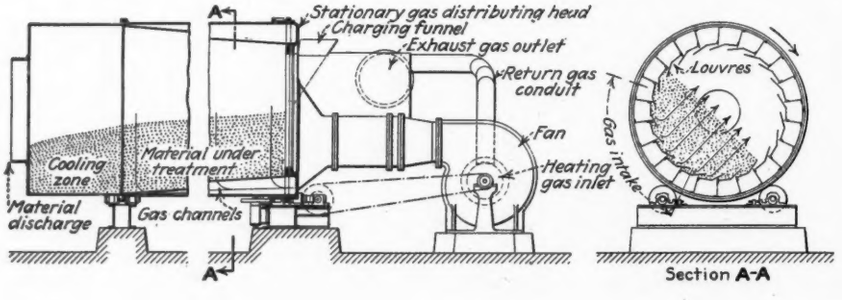
Dryer of New Design

A NUMBER of installations of the Pehrson Dryer, a new British development, are being used for food products in Europe. The dryer, which is being marketed in the United States by the Technical Economist Corporation, New York City, is suitable for a considerable range of granular and lump material.

As shown in the illustration, the new dryer consists of a cylindrical shell around the inner periphery of which are arranged gas passages communicating with the interior through a number of louvres. These are so designed that material does not fall into the gas passages as the drum rotates.

Hot gases for drying are introduced into the gas passages in a region directly under the mass of material. A surface-valve arrangement limits the passage of the gases to those openings which lie beneath the material, thus making it possible, it is claimed, to use a dryer which is smaller for a given capacity than any other type of direct-heat dryer.

Direct-heat dryer and direction of gas flow



Manufacturers' Latest Publications

Temperature Control. Fulton Sylphon Company, Knoxville, Tenn. — Bulletin No. 150, treating "Sylphon" regulators for automatic temperature control of refrigerating systems.

Mixer. Hottmann Machine Company, 3325-47 Allen Street, Philadelphia, Pa.—Leaflet showing constructional details of "Twin-screw Super Mixer," for foods, pastes, emulsions, etc.

Evaporated Milk. Evaporated Milk Association, Chicago, Ill.—"Eating for Efficiency," a 65-page booklet by Meta H. Given stressing the place of evaporated milk in the diet. A number of diet charts are included.

Psychrometers. Bristol Company, Waterbury, Conn.—An illustrated catalog giving details of recorders of relative humidity, together with principles of operation and uses.

Flour Handling. Baker Perkins Company, Inc., Saginaw, Mich.—An attractive catalog describing "B-P" automatic flour handling equipment. Illustrated with photographs of installed apparatus.

Dairy Equipment. Creamery Package Manufacturing Company, 1243 West Washington Boulevard, Chicago, Ill.—Bulletin entitled "Modern Dairies Equipment," containing over one hundred illustrations of this equipment at various installations throughout the country.

Mixers and Peelers. Reynolds Electric Company, 2650 West Congress Street, Chicago, Ill. Bulletin 604, entitled "Reco Food Mixers and Vegetable Peelers," giving specifications, constructional details and uses for these products. Prices are included in the bulletin.

Power Transmission. Ramsey Chain Company, Albany, N. Y.—Catalog 628; well illustrated 90 page catalog and data book on silent chain drives.

Material Handling. Stephens-Adamson Manufacturing Company, Aurora, Ill.—Bulletin descriptive of the "S-A" box car loader.

Material Handling. Williamsport Wire Rope Company, Williamsport, Pa. — 150-page book entitled "Cutting Material Handling Costs." a discussion of material handling from the standpoint of wire-rope equipment. The book is intended as a textbook of tramway and cableway transportation.

Filtering. D. R. Sperry & Company, Batavia, Ill.—Bulletin No. 3, completely descriptive of filter presses.

Screening. Great Western Manufacturing Company, Leavenworth, Kan.—Bulletins describing type "V" screening machine, type "CR" sifting and mixing machine, type "V" starch cleaner, type "A-3" sifting machine.

Filtering. Philipp Wirth, Inc., 31 Union Square, New York City—Two leaflets, one describing Seitz germproof filters for water and serum, and one treating germproof filters for chemical products, including vinegar, cider, grape, lemon and similar juices.

Filtering. Johns - Manville Corporation, 292 Madison Avenue, New York City—Attractively illustrated booklet explaining the character and use of "Celite Filter-Aids" in filtration practice.

Canning and Packaging. C. T. Small Manufacturing Company, St. Louis, Mo.—A 75-page catalog, containing a large number of full-page illustrations, explaining the automatic canning and packaging machinery made by this company.

Regulators. Minneapolis-Honeywell Regulator Company, Minneapolis Minn.—A catalog made up of bulletins classified under three headings: Industrial Motor Valves; Temperature, Pressure and Combustion Controllers; Automatic Control for Unit Heaters.

Screening. Productive Equipment Corporation, 7535 South Claremont Avenue, Chicago.—The "Jigger" vibrating screen for grading sugar, starch, salt, etc., is described. Mechanical details and dimensions are shown by line drawings.

Pasteurization. Creamery Package Manufacturing Company, 1243 West Washington Boulevard, Chicago, Ill.—Bulletin C-300, describing the theory and construction of the helix holder; Bulletin D-213, describing the "CP" Double Tube Precision Milk Heater; Bulletin M-242, treating the "Progress" direct expansion ammonia ice cream freezers.

NEWS *of the* MONTH

Meat Packers' Code Gets O.K. Of Agriculture Department

OFFICIAL approval of the code of trade practices adopted by the meat packing industry in Chicago on Oct. 22 was contained in letters sent to members of the conference on Nov. 11 by Secretary Arthur M. Hyde of the U. S. Department of Agriculture. Urging all elements of the industry to comply strictly with the code as unanimously agreed upon, Secretary Hyde said: "The department will take such action as the facts and law may warrant with respect to alleged violation of these resolutions by packers subject to the provisions of the packers and stockyards act."

Secret rebates or allowances, obscuring prices, discrimination between buyers, the use of premiums, guarantees against lowering of prices, false or misleading statements about grade, quality, or preparation of products, and the making of defamatory statements were ruled against by the packers.

At least 95 per cent of the meat packing and wholesaling industry, on the basis of gross sales, were represented at the conference, so it is expected that adherence to the practices agreed upon at the conference will result in great benefits to producers and consumers as well as the meat packing industry.

Approve Trade Rules of Cold Storage Industry

TWELVE trade practice rules for the cold storage industry were given official approval by the Federal Trade Commission on Nov. 8. These rules will go into effect on Dec. 9, it was announced.

With but a few slight changes, the rules which went into effect were those adopted at the conference of the industry in Minneapolis, Minn., last July. The resolutions were divided into two groups, one accepted as condemning unfair methods of competition in violation of the law, the other merely as expressions of the trade. Among those in the first group are resolutions concerning such irregularities as issuance of a warehouse receipt when the products for which it is issued have not been received by the one issuing the receipt, and issuing a negotiable warehouse receipt for stored products of which the one issuing such receipt is owner, without stating the fact of ownership.

Other rules condemning unfair methods of competition apply to such practices as misrepresentation of the cold storage business or its methods or the facilities furnished; commercial bribery; price discrimination; interference with contract; secret rebates; selling facilities or services below cost; and selling without profit to injure a competitor.

Rules accepted by the Commission as expressions of the trade cover such subjects as publication of prices; subsidizing customers; and creation of a committee on trade practices to investigate and determine whether these rules are being observed.

Packers' Consent Decree Case Off Till Dec. 19

ANOTHER continuance of the hearing on the packers' consent decree, this time until Dec. 19, was granted Nov. 13 by Justice Wendell P. Stafford, of the Supreme Court of the District of Columbia, upon consent of the parties concerned.

The petition of the packers asks for modification of a decree entered into in 1920, preventing them from engaging in any business of food-products handling except that of meat and meat products, and from establishing retail meat markets. The modification requested is based upon the change in economic conditions, which, the petitioners contend, no longer justify the purpose of the decree.

This petition is the latest step in a veritable maze of litigation concerning the decree which began shortly after it became operative.

COMING EVENTS

DECEMBER

2–4—American Institute of Chemical Engineers, Asheville, N. C.
2–4—New England Bakers' Association, Boston.
2–7—National Exposition of Power and Mechanical Engineering, New York City.
3–5—Southern Association of Ice Cream Manufacturers, Biloxi, Miss.
4–6—Wisconsin Cheesemakers' Association, Milwaukee.
4–7—American Society of Refrigerating Engineers, New York City.
10–11—Tri-State Packers' Association, Philadelphia, Pa.
30-31 and Jan. 1—Society of American Bacteriologists, Ames, Iowa.

JANUARY

6–8—Northwestern Canners' Association, Seattle, Wash.
15–16—New England Association of Ice Cream Manufacturers, Boston.
20–24—Canning Machinery and Supplies Association (meeting and exposition), Chicago.
20–24—National Canners' Association, Chicago.
20–24—National Food Brokers' Association, Chicago.
21–23—National Preservers' Association, Chicago.
21–23—National Pickle Packers' Association, Chicago.
27–31—International Heating and Ventilating Exposition, Philadelphia.

'Multiple Seizure' Won't Halt, Says Campbell

THE FANCIED threat of multiple seizure seems to have been set up as a straw man for the purpose of inspiring zeal for modification of the Federal Food and Drugs Act which would practically amount to nullification as far as patent medicines are concerned," contends W. G. Campbell, head of the Food, Drug and Insecticide Administration. Retaliating against agitation which would restrict seizure to one operation, such as contained in the resolution condemning multiple seizure passed by the Flavoring Extract Manufacturers' Association, Mr. Campbell holds that certain writers are "deliberately endeavoring to create a false idea as to the extent and purpose of the seizure actions."

Only when products are a serious danger to public health, as in the case of those infected with the deadly *Bacillus botulinus*, is this action invoked, and here, said Mr. Campbell, "we unhesitatingly institute campaigns for the purpose of removing articles from the market, wherever and whenever we find them, and make no apologies for such action."

Aluminum Cans Are Tried In Norway

THE USE of aluminum cans in place of the conventional "tin" variety has possibilities of revolutionizing Norway's canning industry, according to a report from Oslo to the U. S. Department of Commerce. At present the experiment is limited to canned fish, 50,000 aluminum cans having been ordered for this purpose, but there is reason to believe that it will be extended.

The Norsk Aluminum Company, Hoyanger, Norway, is backing the experimentation. This firm is making plans to install rolling equipment for the special gage sheets that are required. While it is admitted that the most serious objection is the price of the new container, it is pointed out that the expense of the printed label may be done away with, as the aluminum can may be attractively embossed. The light weight, and consequent lowering of shipping costs, is said to be another advantage. Then too, the empty cans, being pure metal, have considerable reclamation value.

It would appear that the low cost of electric energy in Norway would make for cheaper aluminum, since the manufacture of this metal is an electrolytic process in which the cost of power is a major factor.

Chemists See Ultra-Violet Rays Test Olive Oil

THOSE two well-known devices of the physicists, the photo-electric cell and the ultra-violet lamp, usurped the center of the stage at the Third Annual Meeting of the American Oil Chemists' Society, held in New York City on Nov. 14 and 15. Both promise to be of great value in establishing the purity of oils.

By combining the photo-electric cell with various types of optical color analyzers, there has been developed a series of instruments which, entirely independent of the human eye, give precise color measurements throughout the spectrum, according to Harold D. Ellsworth, of the American Photo-electric Corporation, who spoke at the meeting. By examining oils or fats with this instrument, there may be obtained a curve showing the percentages of color of each wave length which make up the whole. It has been found that various types of oils give characteristic shapes of curves, so that the instrument not only classifies the color of the particular sample but identifies it, and may even hint at the type of impurities it contains.

A paper telling of the use of ultra-violet rays in detecting the presence of refined oil in virgin olive oils was given by Sidney Musher, of the Pompeian Corporation, Baltimore, and a demonstration of the test provided. In the presence of ultra-violet rays, virgin olive oil—oil in which the chlorophyll has not been subjected to heat—emits a bright yellow fluorescence. Refined oil, on the other hand, emits a blue-white fluorescence. Mixtures of the two containing down to 10 per cent refined oil never acquire the bright yellow color of the pure virgin oil. It was mentioned that adulteration with quantities of refined oil would not pay unless percentages much higher than those easily detectable were used. Several samples of imported oil supposedly virgin registered the presence of refined oil so clearly that it could be seen across the room.

The test cannot be faked by the addition of unheated chlorophyll to refined oil, it was shown, for the resulting oil gave a green fluorescence. California oils made in one pressing may be distinguished from first pressing European oils, the tests proved.

Action was taken at the meeting to bring about the adoption of the ultra-violet tests as standard for testing olive oil. Approval to this action was given by the olive oil committee of the association.

Several of the other papers presented at the meeting were of considerable interest. Dr. David Wesson, technical director of the Southern Cotton Oil Company, gave an interesting talk on the history of the vegetable oil industry, tracing the methods of refining in use from the beginning up to the present.

Dr. Arthur D. Holmes, director of the research laboratories of E. L. Patch Company, Boston, told of the relation of cod liver oil to the vitamin theory. He traced the history of vitamins from the early work on purified foods which, inexplicably, would not sustain life, to our present knowledge of six, and possibly eight, distinct types. After a brief mention of the growth of the cod liver oil industry to a value of $3,000,000 a year in the United States, he went on to tell of the pathological changes which result from lack of Vitamins A and D, the important cod liver oil vitamins.

Michigan Fruit Canneries To Combine

Plans for the consolidation of ten of the largest fruit canning plants in western Michigan and twenty co-operative fruit packing and cold storage plants were announced on Nov. 19 by Fred L. Granger, president of Michigan Fruit Growers, Inc.

The organization will be known as the Great Lakes Fruit Industries, Inc., and will be capitalized at $3,000,000, controlling about 90 per cent of the fruit canned in Michigan.

Included in the group will be most of the fruit canning plants from St. Joseph to Traverse City. The organization also will have a working agreement with co-operative fruit canning interests in Wisconsin. The project was developed under suggestions outlined by the Federal Farm Board and constitutes the first large co-operative program to be undertaken in Michigan.

Bloom on Chocolate Coatings Reduced by Lecithin

THAT age-old problem of the confectioner, the development of gray bloom on chocolates, may be solved by the use of a fractional percentage of lecithin, according to Sherman Woodrow in the November issue of *The Manufacturing Confectioner*. Bloom has been established as a crystallization on the surface of chocolate of the lower-melting fractions of cacao fat, brought to the surface when the temperature is sufficient to liquefy these lower-melting fractions while the other fractions remain in the solid phase.

Lecithin is a lipoid, or fat-like substance, of uncertain chemical composition that occurs naturally in nerve tissue, particularly in the brains and spinal cords. It occurs in considerable quantities in egg yolk; in fact, it is often used as an index of egg percentage in testing such products as egg noodles.

Except for a limited medicinal use, lecithin has heretofore been of little industrial value, although at times it has been used with egg substitutes to confuse the chemist into believing that egg yolks were actually present.

Experiments now indicate that by incorporating about 0.25 per cent of the material in the coating, resistance to bloom is considerably raised.

Oppose Patent on Process To Remove Spray Residue

PATENT RIGHTS covering the use of a dilute solution of acid or alkali in removing spray residue from fruits and vegetables are being contested between the U. S. Department of Agriculture and the firm of Brogden & Trowbridge, of California. Both have made application for a patent on the process.

The method of removing spray residue involved has been extremely useful in preparing fruit for market, and has been in almost constant use in various fruit regions since 1925. According to claims of the Department of Agriculture, it was first conceived and put into practice by its employees. Acting through Arthur M. Henry, chemist of the Philadelphia station of the Food, Drug, and Insecticide Administration, it has applied for a patent on the process with the avowed intention that if the patent is granted to Mr. Henry it will be dedicated to the service of the public and may be used by anyone without royalty charges or other costs. The Henry patent application has been declared by the Patent Office to be in interference with the application of Brogden & Trowbridge.

Depositions are being made by several members of the department to show that Mr. Henry's work was done prior to that of Messrs. Brogden & Trowbridge.

Wheat Flour Definitions To Have Public Hearing

A PUBLIC HEARING on the definitions proposed for wheat-flour grades by the Food Standards Committee of the Department of Agriculture will be held before final approval is given to the definitions.

The date of the hearing has not yet been decided, but it probably will be in March or April. Firms or individuals intending to be represented should communicate with A. S. Mitchell, secretary of the committee, so that announcements may be sent them.

The proposed definitions are as follows:

WHOLE WHEAT FLOUR, ENTIRE WHEAT FLOUR, UNBOLTED GRAHAM FLOUR, GRAHAM FLOUR, is the clean, sound product made by grinding wheat, and contains in their natural proportions all of the constituents of the cleaned and scoured grain.

BOLTED GRAHAM FLOUR, BOLTED GRAHAM, is the clean, sound product made from wheat by grinding and bolting and contains all of the grain except a portion of the bran.

FLOUR, WHEAT FLOUR, WHITE FLOUR, is the clean, sound, finely ground product obtained in the commercial milling of wheat and consists of the flour cells of the endosperm. It contains not more than 15 per cent of moisture, not less than 1.25 per cent of nitrogen, not more than 1 per cent of ash, and not more than 0.5 per cent of fiber.

Senate Adjourns Without Considering Sugar; News from Washington

By Paul Wooton
Washington Correspondent

EXCEPTING the one major item of sugar, Congress practically completed its work on the food phases of tariff revision before the special session was adjourned. It is probable that the sugar schedule will be one of the first taken up by the Senate when and if work on the bill is resumed at the regular session. Around this the tensest of all controversies having to do with duties on food products revolves. Indications are that, at most, nothing more than the sustaining of the Senate Finance Committee rates, built on a duty of 2.20 cents a pound on 96-degree Cuban sugar, will be done by way of increases. Odds probably are against any raising of present sugar duties. Bounties, however, may be provided domestic producers.

There is no likelihood of a barrier being erected against free importation of sugar from the Philippines. Nor is there any likelihood of the present free trade status of coconut oil from the Philippines being disturbed. This means that little more will be done anent duties on vegetable oils, though when individual amendments are in order at the regular session there will be further discussion of some of those duties.

Practically all Senate Finance Committee amendments having to do with food products duties, excepting ones in the sugar schedule, have been disposed of. Nearly all those envisaging reductions in present duties, or of rates adopted by the House, were rejected by the Senate. Practically all of those making for increases were adopted.

Aside from dairy products, the House bill increases for these being further hoisted by the Senate, most of the committee amendments related to incidental items. Ones envisaging seasonal variation of duties on some fresh fish and vegetables were rejected.

The Senate's inclination seems to be to sustain in general the House's rates on food products, most of which are classed as agricultural. The body is not inclined to adopt as high duties as were commonly asked for by spokesmen for agriculture at the hearings.

Further effort probably will be made to have duties supplementary to the present general 42-cent rate put on wheat of extra high protein content, and it may be successful. It is unlikely that anything further will be done as to the milling-in-bond provision concerning flour shipped to Cuba.

All Senatorial leaders who are having anything to say about it declare that work on the Hawley-Smoot tariff bill will be resumed and carried to completion at the regular session of Congress. Yet there is a cast of vagueness and uncertainty in what they say. Regular Republican leaders are inclined to the view that the Senate will complete a bill which will be shaped up in conference more or less satisfactory to all concerned. Coalition leaders of conservative type are inclined to believe that the bill will die in conference. Those Senators who are of a severely realistic tendency of thought doubt that the Senate will finish its work on the bill, are rather doubtful if whatever bill it possibly may finish will receive the approval of a majority in the Senate, and believe that, if it does, the bill is likely to expire in conference.

Color in Food

WHEN THE CONSUMER demands color in food as well as in the dish in which it is served, lack of distinction in this respect, due to carelessness and lack of technique in growing, harvesting, packing and shipping have a depressing effect upon prices. Color is a particularly important factor in fruit, according to F. G. Robb, of the U. S. Bureau of Agricultural Economics. Reviewing the results of 12 years' experience in the inspection of food products, Mr. Robb states that there has been a marked improvement in the quality of native fruits in domestic markets.

Color is a difficult quality to judge because of the individual characteristics of different varieties of the same fruit. He explained that when apples are passing with some rapidity in front of the sorters it is likely that an uncolored apple will get by occasionally. There is a grade tolerance for such errors, but when the inspector finds 20 to 30 per cent of the apples showing practically no color in some barrels while other barrels show practically no under-colored fruit, it demonstrates careless packing-house management, said Mr. Robb, pointing out that under-colored apples cannot be forced on the market at top prices.

Factors subordinate to color are size, maturity and defects due to insect injury, disease, improper packing and rough handling. Sizing can be done properly only by machinery, according to Mr. Robb. Over-maturity causes the most trouble. It may result from allowing the fruit to remain too long on the trees, from improper storage or transport temperatures. Blue mold rot is the most common type of decay. It results from punctures, bruises or other skin breaks. The great variation in the prevalence of this decay in different lots in the latter part of the season, said Mr. Robb, reveals the difference in the effect of proper and improper handling methods.

At this time of year there also is a wide variation in the extent of damage from scald. Oil wraps in boxes and shredded oil paper in barrels and baskets prevent this condition, but the paper must be scattered through the package if treatment is to be effective. Tightness or slackness of pack are causes of loss, particularly in barrel packing. Slack packing or crushing of apples just beneath the head of the barrel can be avoided by proper racking or shaking down of the barrels as they are being filled.

Fruit Juice Definitions Are Drawn Up

TENTATIVE definitions of fruit juice, grape juice, and orange juice were drawn up by the food standards committee of the Food, Drug, and Insecticide Administration at a recent meeting in Washington. Criticisms and suggestions regarding the proposed definitions and standards are now invited from food officials, consumers, and the trade.

The definitions proposed are as follows:

Fruit Juices are the clean, unfermented juices obtained from the first pressing of sound, mature, fresh fruits, or of their pulp, and correspond in name to the fruit from which they are obtained.

Grape Juice is the unfermented, expressed juice of clean, sound, mature grapes. It is made by a single pressing of the fruit, with or without the aid of heat, and with or without the removal of insoluble matter.

Orange Juice is the clean, unfermented juice, with or without portions of the pulp, obtained from the sound, mature fruit of the orange, *Citrus sinensis:*

(a) by reaming or burring the cut fruit,

(b) by pressing the pulp after removal of the peel, or

(c) by pressing the whole fruit with subsequent removal of oil derived from the peel.

Communications regarding these proposed definitions should be addressed to A. S. Mitchell, secretary, food standards committee, Food, Drug, and Insecticide Administration, Department of Agriculture, Washington, D. C.

Canned Chicken Grows In Favor

NEARLY 2,000,000 lb. of poultry was canned at eleven plants during the month of September, and increase in consumer demand for this product is continuing, inspection records show.

At the request of these canning plants, inspectors of the Bureau of Agricultural Economics are maintained to examine the individual birds at the time the entrails are removed, and to see that unwholesome birds are destroyed. Canners using this service are permitted to state on the labels of the cans that the contents has been certified by the department.

Clouded Outlook for Next 90 Days

IN LINE with practically all business and industry, the near future sales outlook in the food products industry is clouded. The industry as a whole will be influenced to a certain extent by the present unfavorable psychological atmosphere, in the opinion of the 5,600 members of the Council on the Trend of Business conducted by *The Business Week*, of whom about 700 are directly interested in the manufacture and distribution of food products. These business executives feel that the usual holiday buying impulse will be much below normal this year, resulting in an average volume of business during the next 90 days only about 1 per cent above that being witnessed at the close of November, and of proportions some 2 per cent under that during the same period last year. These men state that their volume of business at the close of November was 4 per cent under that being witnessed at the close of October, and of proportions about 2 per cent under that at the close of November last year.

The members of the Council interested in the food products industry indicate that every section of the country except the St. Louis section witnessed a decrease in the volume of business during November as compared with October, the greatest decrease being reported in the East North Central States with 10 per cent.

United Fruit Will Merge With Cuyamel

CONFIRMATION of the report that the Cuyamel Fruit Company would be merged with the United Fruit Company was made by Samuel Zemurray, president of the former organization, on Nov. 25. Holders of more than two-thirds of the stock in the Cuyamel company have signed the consent agreement accepting the offer of United Fruit of 300,000 of its shares for the assets and properties of the Cuyamel organization.

The United Fruit Company is the largest organization engaged in the tropical fruit and products business, and the Cuyamel company is said to rank next. The combined company will have assets totalling more than $250,000,000. The business enterprises of the two companies are almost exactly similar.

Food Products Companies Increase Earnings

EARNINGS reports which have been made available so far indicate that the high rate of general manufacturing activity which has prevailed since the opening of the year has been reflected in good earnings by food products companies. The National City Bank, of New York City, in a tabulation finds that the combined net profits of 23 food products companies show a gain of 26 per cent in the third quarter and 16.3 per cent for the first nine months.

The excellent position of the food products industry during 1929 is indicated by a comparison of reports from some 600 companies covering all industries. The combined net profits of this group for the third quarter amounted to $1,142,302,000 as compared with $1,001,244,000 in the third quarter of 1928, or a 14 per cent gain as against 26 per cent for the companies in the food products industry. For the first nine months the same aggregation of companies had net profits of $3,223,620,000, which compared with $2,679,934,000 in the corresponding nine months of 1928, or a gain of 20 per cent against a gain of 16.3 per cent for the food products industry.

The accompanying tabulation gives the earnings per common share of some of the more outstanding companies in the food products field since 1925, and an estimate, based on the latest reports, of the earnings per common share for 1929. These estimates are made by the Standard Statistics Company.

Dairy Engineers Make Plans To Organize

PLANS for the formation of what probably will be known as the Dairy Engineering Society, made by a group of three hundred dairy engineers at the Dairy Industries Exposition on Oct. 24, constitute one of the most significant achievements of that great gathering of those interested in the dairy industry. In the engineering session held at the exposition, papers by engineering leaders in the field stressed the need for trained, up-to-date men, and an organization was seen as essential in promoting such training and in maintaining a forward-looking viewpoint.

Those in charge of the preliminary organization of the new Dairy Engineers group were the members of the dairy engineering committee of the American Society of Agricultural Engineers. This committee was instructed by the delegates to choose a subcommittee of ten persons from names submitted by the International Association of Ice Cream Manufacturers, the Dairy and Ice Cream Machinery and Supplies Association, the International Association of Milk Dealers, the Dry Milk Institute, and by dairy machinery manufacturers.

Quick-Freezing Process Rights Acquired

SOLE LICENSING rights to the Kolbe "diving bell" and "floating pan" quick-freezing systems, and to the Zarotschenzeff "brine fog" system have been acquired by S. C. Bloom & Company, Chicago, Ill. Under the new arrangement, R. E. Kolbe, Carl F. Kolbe and M. Zarotschenzeff will be associated with the S. C. Bloom organization.

Mr. Bloom himself holds several patents on refrigeration methods, and is a partner in the firm of Bloom & Kamrath, consulting refrigeration and packing plant engineers.

Earnings of Corporations in Various Branches of the Food Industries

(Courtesy of the Standard Statistics Company)

Name of Company	Earnings per Common Share 1925	1926	1927	1928	Estimated 1929
American Chicle Co.	*2.50	*2.66	*3.04	*3.58	4.00
American Ice Co.	*5.43	*4.27	2.92	3.92	5.50
Armour & Co. (Ill.)	(a) 2.00	(a) 0.62	(a) 4.32	(a) 1.12	(a) 1.12
Beatrice Creameries	(b) 6.25	(b) 6.18	(b) 5.97	(b) 6.07	(b) 5.58
Beech-Nut Packing Co.	5.38	5.15	5.23	7.17	7.25
Borden Co.	*5.33	*5.41	*5.16	*4.53	5.25
California Packing Co.	*6.18	5.17	3.52	6.38	8.00
Canada Dry Ginger Ale	*2.74	*3.80	5.07	6.10	7.50
Coca-Cola	14.47	16.50	9.16	10.19	12.00
Continental Baking Co.	(c) 9.02	(c) 8.05	5.08	4.15	8.25
Corn Products Refining Co.	2.16	3.88	3.50	4.34	5.15
Cuyamel Fruit Co.	3.53	2.04	6.23	5.23	12.00
General Baking Corp.	†0.27	†0.18	†0.59	0.46	0.45
General Foods, Inc.	*3.65	*3.39	*3.97	†3.75	4.50
General Mills, Inc.	†1.31	†6.08	†6.41	(d) 7.16	8.00
Gobel, Inc.	.....	.....	.....	1.61	3.00
Gold Dust, Inc.	.....	.....	.....	(e) 3.16	4.25
Great Atlantic & Pacific Tea.	.....	(f) 5.49	(f) 6.19	(f) 8.23	(f) 11.02
Hershey Chocolate Corp.	(g) 2.79	(g) 3.67	(g) 3.00	6.59	10.00
Kraft-Phenix Cheese	*1.78	*1.46	*1.56	2.04	3.25

Name of Company	Earnings per Common Share 1925	1926	1927	1928	Estimated 1929
Kroger Grocery & Baking Co.	*2.75	*3.47	*3.73	*3.30	4.50
Libby, McNeill & Libby	1.70	1.84	0.77	2.60	3.00
Loft, Inc.	0.39	0.05	0.48	0.30	(h)
Loose-Wiles Biscuit Co.	*2.24	*2.75	3.25	4.07	5.00
National Biscuit Co.	5.79	6.32	7.11	7.31	8.00
National Dairy Products	*1.58	*3.30	*3.35	*3.27	5.00
Ogilvie Flour Mills	(i) 8.24	(i) 11.48	(i) 17.54	(i) 24.02	(h)
Penick and Ford	2.25	1.37	2.04	2.56	4.00
Pillsbury Flour Mills	†2.20	†4.92	†4.51	5.12	4.75
Purity Bakeries Corp.	(c) 1.69	(c) 2.92	(c) 4.50	5.86	7.25
Quaker Oats Co.	*8.12	*12.04	*11.60	*12.39	14.00
Schrafft (Shattuck)	3.99	4.38	5.29	6.25	(k) 2.50
Standard Brands, Inc.	.....	†1.67	†1.71	†1.69	2.00
Standard Milling	(l) 10.02	(l) 7.35	(l) 11.07	(l) 10.48	(m)
Swift & Co.	10.25	10.43	8.13	9.87	9.00
United Fruit Co.	*8.59	*7.42	*7.48	*7.84	7.50
Ward Baking Co.	2.19	2.71	2.32	0.72	(n) 0.48
Wesson Oil and Snowdrift	.....	*4.35	*2.81	*3.53	2.07
Western Dairy Products	(c) 1.46	(c) 2.78	(c) 0.82	(c) 0.62	1.50
Wilson & Co.	Nil	Nil	Nil	Nil	Nil

*Adjusted earnings. †Indicated earnings.
(a) Earnings on Class A—None on Common.
(b) For fiscal year ending Feb. 28.
(c) After depreciation.
(d) On average shares.
(e) Ten months report.
(f) For fiscal year ending Feb. 1.
(g) Predecessor companies.
(h) Estimation impossible.
(i) Fiscal year ending Aug. 31.
(k) On basis or recent increase in capitalization.
(l) Fiscal year ending June 6.
(m) Merged with Gold Dust, Inc.
(n) For 27 weeks of current year ending July—Indicates slight gain.

Co-operative Warehousing Seen as Great Advance by Grocery Manufacturers

A.G.M.A. Convention Considers New Developments in Distribution—Hears of Economic Possibilities of Concentration—Would Change Sherman Act

BY ESTABLISHING co-operative grocery terminals in principal cities throughout the country as a means of concentrating distribution, grocery manufacturers will be taking one of the most progressive steps in the history of the industry, said H. R. Drackett, president of the Associated Grocery Manufacturers of America, Inc., at the 21st annual convention in Washington, Nov. 5-7.

This specific proposal was but one of the manifestations of the emphasis which was placed upon concentration in distribution at the convention. In his opening address on the morning of Nov. 6, Mr. Drackett said, in part:

"The major trend of American business is toward concentration, developed with the belief that concentration is the solution for greater business efficiency. And assuredly concentration finds in the distribution phase the greatest opportunity for improvement. Certainly we of the grocery trade are thoroughly conscious of the fact that the concentration movement within our industry has brought groupings that are very properly defined distribution mergers.

"Groups of similar or related products, such as cereals, have specific problems of their industry. They are frequently technical problems and require technical study. But it cannot be denied that the deeper and more fundamental question with which all of these manufacturing groups are concerned is that of distribution.

"Trade practice, trade relations, business ethics and even the business and trade laws of our national and state governments are going to be dictated very largely by group action. With organized trade associations improving their facilities, does it not behoove us as manufacturers to develop this group consciousness? We are acting with this group consciousness in many of our present activities, but I am certain that our action would have greater assurance of its soundness and fairness had we the benefit of a larger group thinking upon fundamental problems."

Since the coming of "big business" in the grocery business, placing the manufacturing industry on the basis of competition existing among a relatively few large corporations, the question of just what constitutes an illegal monopoly has become increasingly more important, it was pointed out by Charles W. Dunn, general counsel for the association.

"It is clear," he said, "that the Sherman Act does not make the mere size of a business or its possession of trade power in itself an offense. It only forbids the abuse of such power by wrongful conduct in undue restraint of trade. Hence a business does not involve illegal monopoly for the reason alone that it is big, however big it may be, and bigness is not a crime. The only law governing bigness, as such, is the economic law."

He brought out, however, the fact that the Sherman Act may prevent business from taking co-operative action to promote constructive competition. Thus small retail stores, for example, which may wish to co-operate in meeting chain store competition, at once encounter legal opposition which does not affect the chain store, and are prevented from rendering that very competition which the law is intended to afford.

It was urged that the following amendment be made to the Sherman law: "It shall be lawful to take any business or trade action the purpose and effect of which shall be to promote constructive competition." A resolution to this effect was passed by the convention.

The Place of the Customer

The status of the customer in regard to distribution problems was treated by Loring A. Schuler, editor of the *Ladies' Home Journal.* He stressed the fact that quality is the first demand of the purchaser. Speaking of the future of the industry, he said: "The next ten years may witness the elimination of the butcher and the fruit stand, and the sale of hard-chilled meats, vegetables, fruits, even frozen milk in a brand new kind of grocery store, or perhaps at the soda fountain. Or we may see a new chain of grocery outlets spring up if the packers win release from the consent decree that now prohibits them from entering the retail trade."

At a research forum on distribution problems, the economic forces underlying the concentration movement, and its effect upon the public generally, were discussed. Dr. Melvin T. Copeland, professor of marketing at the Harvard Graduate School of Business, who presided at the forum, urged the delegates to face the facts which marketing research was bringing to light, pleasant or unpleasant though they might be.

In the ability to co-ordinate the various uits, particularly on the side of distribution, lies the success or failure of the recent great mergers of food manufacturers, said Prof. C. E. Griffin, of the University of Michigan, in discussing the effect of concentration on costs.

"The new concern," he held, "may make more or less profits than the old. That question, it seems to me, is not a vital matter to consumers. The question of efficiency and the resulting marketing costs are much more important to consumers than the question of large or small net profits. The public is coming to realize what many of our best manufacturers have long known; that high profits do not necessarily, or even typically, flow from high prices. High prices more often result from inefficiency than from profiteering."

Fears of the establishment of a monopoly in retail food distribution were scouted by Prof. W. C. Weidler, of Ohio State University. Commenting upon the success of the chain store, he said: "Whether or not such concentrations in the field of manufacturing will result in reduced marketing costs is open to question." Prof. H. W. Hess, of the University of Pennsylvania, told how the concentration movement is improving merchandise and service to the customer.

Prof. Ray Westerfield, of Yale University, contended that large-scale production and distribution should undoubtedly have advantages for standardized products, but questioned the ability of huge inelastic organizations to follow changes in public taste in the fields of less standardized goods. An interesting discussion as to whether a single salesman should handle a large variety of products, rather than concentrate on a single product, showed a marked difference of opinion.

A growth in co-operation between manufacturer and wholesaler was prophesied by T. F. Branham, president of the National Wholesale Grocers' Association. "Our attitude of self-interest has made possible the creeping in of wasteful methods of merchandising," he said. "Manufacturers are staggering under burdensome selling expense. Wholesale grocers are not performing entirely as they should. Where these wastes exist they must be eliminated. Many a manufacturer has said that when a wholesale grocer will perform the selling function as he can, no means has been discovered, or probably ever will be, to take his place."

Takes Stand for Retailer

The stand of the retail grocer was taken by Eugene S. Berthiaume, president of the National Association of Retail Grocers. He asserted that the advantage of increased buying power given to the chain was of little significance when compared with such fundamental principles of good management as cleanliness, good salesmanship, and an intimate knowledge of customers' wants.

For the chain store, R. W. Lyons, executive secretary of the National Chain Store Association, spoke of the service rendered manufacturers by supplying a dependable, ready-made market which enables the manufacturer to dispense with expensive promotion schemes and to stabilize production. J. Frank Grimes, of the Independent Grocers' Alliance, told of the establish-

ment of voluntary chains which can utilize the benefits of concentration without destroying individual proprietorship. Willis W. Johnson, president of the National Food Brokers' Association, told of the brokers' function in grocery distribution, and W. M. D. Miller, of the Lehigh Wholesale Grocery Company, Allentown, Pa., quoted comparative figures to show that retailer-owned co-operative wholesale groceries achieve wholesale distribution at the lowest cost, at the same time preserving individualism of the retail store.

The view of the outsider was given by O. H. Cheney, vice-president of the Irving Trust Company, who spoke on the subject, "Where Are the New Developments Leading the Grocery Industry?" After dwelling upon the various problems which have arisen because of changing economic conditions, keener competition, and concentration, Mr. Cheney said: "The basic responsibility is to the consumer—the responsibility for pure, wholesome, clean food, truthfully labeled, honestly sold, in full measure.

"If, at any time, the stress of competition tempts any manufacturer, big or little, to deviate in the slightest degree from this basic responsibility, then the whole food industry in endangered. The very size of the big companies makes them bigger targets for public opinion—they cannot hide. The big food corporation, fortunately, is intelligent enough to know that it is living in a glass house—and that there are plenty of people waiting to throw the first stone."

At the final session of the convention the following officers were elected for the ensuing year: President, Geo. D. Olds, Jr., vice-president and general sales manager, Hills Bros. Company; first vice-president, Charles A. Vilas, general counsel, National Biscuit Company; second vice-president, Geo. H. Burnett, treasurer and general sales manager, Joseph Burnett Company; third vice-president, D. F. Bull, vice-president and treasurer, Cream of Wheat Company; treasurer, B. E. Snyder, secretary and treasurer, R. B. Davis Company; executive vice-president, Robert F. Miller; general counsel, Charles Wesley Dunn.

"What Price Volume?" Stirring Keynote At Mayonnaise Convention

Enthusiastic Gathering at Atlantic City Works to Improve Quality, to Better Marketing Methods and to Increase Co-operation

THE FALLACY of looking only to volume of production at the expense of quality and of profit was emphatically exposed in an address by President C. P. McCormick at the Fourth Annual Convention of the Mayonnaise Products Manufacturers' Association, held in Atlantic City on Oct. 28-30.

Before the largest gathering that has ever attended a convention of the association, with representatives of over ninety manufacturers in attendance, Mr. McCormick asked, "Why continue on the supposition that tomorrow will bring in that lost profit of yesterday because your sales are larger?" He dwelt upon the fact that the industry must always be of a localized nature, stressing the point that a perishable article of this nature can never be monopolized by a select few. Stating that success in the past has been due to a "striving to maintain high quality at a reasonable price, and to quick deliveries," he urged that the smaller manufacturers maintain their natural advantage in this field, not by first seeking to build production volume, but by concentration upon quality of product and co-operation in methods of manufacture.

Several significant points were brought out in the annual report of Executive Secretary Frank Honicker. He spoke of the efforts of the Association to eliminate unfair trade practices, to retard the distribution of free goods and to bring about proper labelling.

"The Future of the Mayonnaise Industry" was the subject of an address by Richard Hellmann, of Hellmann Products Company, Inc. and "Distribution Problems, Past and Present" were discussed by Gordon James, editor of *The Business Week*. In presenting the report of the standards and research committee, Chairman D. M. Gray urged the establishment of a fellowship in the Food Research Division of the Department of Agriculture and asked that a sum of $5,000 per year be appropriated for this purpose. The work of several of the sub-committees in various phases of mayonnaise research was developed.

Among other papers presented at the convention upon which attention was focussed, "The Nutritive Value of Mayonnaise," by Dr. E. M. Nelson, of the protein and nutrition division of the Bureau of Chemistry and Soils, was prominent. In addition to the food value of the mayonnaise itself, which, Dr. Nelson pointed out, depend primarily upon the vegetable oil and egg yolk used, the fact that the use of mayonnaise runs hand in hand with a diet of green leafy vegetables is significant. The benefit to the digestion brought about by the psychological effect of eating attractive looking foods such as salads is another point which cannot be overlooked, according to Dr. Nelson.

Trade relations were discussed by Hugh P. Baker, of the Trade Association of the U. S. Chamber of Commerce. He stressed the value of codes of ethics which are universally followed, and urged that the mayonnaise industry co-operate in doing away with previous trade practices without the necessity for governmental supervision.

An amazing record of the growth of the mayonnaise industry was presented by R. S. Hollingshead, acting chief of the foodstuffs division of the Bureau of Foreign and Domestic Commerce, who gave the results of a questionnaire submitted to 725 firms.

The future of retail distribution lies in a realization of the importance of the grocer as a discriminating buyer for the community rather than a mere machine for distribution it was pointed out by Ransom R. Gilbert, of the Department of Commerce. He also urged manufacturers to concentrate upon local needs before attempting national distribution.

A maximum moisture content of from fifteen to nineteen per cent makes mayonnaise most resistant to low-temperature troubles, it was pointed out by Benjamin Harris, of Epstein, Reynolds & Harris. He held that the size of the oil globule had little effect upon the behavior of mayonnaise at low temperatures.

Corrosion Study Planned

Experimentation to determine the metals and alloys most satisfactory for equipment used in the manufacture of mayonnaise was planned at a meeting of the committee on standards and research held on Oct. 30. In addition to committee members, others interested in the corrosion problems of the industry were present, including H. E. Searle, of the International Nickel Company, and Walter M. Mitchell, of the Central Alloy Steel Corporation.

Although utensils and equipment now in use are almost universally tin plated, it was decided to conduct experiments with silver, tin, nickel, Monel-metal, chromium alloys, and chromium-nickel alloys. Tests will be made with the individual materials used in mayonnaise manufacture, such as mustard and vinegar, and with the product itself. At the plant of the B. S. Pearsall Butter Company at Elgin, Ill., mixer blades will be equipped with the various alloys in a simulation of actual operating conditions.

Corrosion will be measured by the inches penetration and by weight lost. The effect of the metals on discoloration of product and breakdown of emulsion will be investigated. A supplementary study of detergents will also be made.

The officers elected for the coming year are: President, C. P. McCormick, of McCormick & Company, Baltimore, Md.; vice-president, Wade E. Utley, of Capital City Products Company, Columbus, Ohio; secretary, Mrs. Anna Schlorer Smith, of Mrs. Schlorer's, Inc., Philadelphia, Pa.; treasurer, W. R. McKeldin, of Atmore & Son, Inc., Philadelphia. Franklin A. Honicker, of Philadelphia, continues as executive secretary.

NEWS IN BRIEF

A refrigerator car in which ice is replaced by mechanical refrigeration, the product of three years' research, has been pronounced successful by the builders, the North American Car Corporation, after many tests. Power is drawn from the axle to operate the "Frigicar," as it has been named.

Vegetable dinners which simulate the home-cooked product are now being packed by the J. E. Barr Packing Company. Cabbage, carrots, rutabagas, potatoes and onions are cooked in beef broth and packed in No. 2½ cans.

The Rice Millers' Association of California has been organized in San Francisco to improve conditions in the rice industry.

Better milk is needed in the manufacture of cheddar cheese if the industry in New York State is to be put on a firm and permanent basis, say experts at the Agricultural Experiment Station at Geneva. Cooling and pasteurizing the milk is urged.

Manufacturers may be held legally responsible for misbranding their goods, even though their customers, jobbers and other distributors are not deceived, the Federal Trade Commission has ruled.

Peanuts have been the subject of price fixing, according to Senator Heflin, and a resolution directing an investigation of peanut crushers and mills has been adopted by the Senate.

The Soviet government will spend $50,000,000 on new meat, cold storage, and edible-oil plants in the next five years. Altogether $750,000,000 will be spent in the Soviet food industries in this period. Contracts for five flour mills, each with a capacity of 2,000 barrels daily, have been awarded American engineers.

"A food association of America, an organization representing the entire food industry," was predicted as "bound to come" by Felix Coste, manager of the National Coffee Roasters' Association, at the recent convention in New Orleans. Mr. Coste also urged the creation of a "Judge Landis" of the coffee industry.

Reindeer meat is continually increasing in importance, and the Department of Agriculture has made a survey of the best methods of handling and preparing the meat which results from what is said to be Alaska's most practical agricultural industry.

The Dutch sugar-beet industry was recently refused a subsidy by the Senate of Holland, which, while admitting the difficulties of the free trade policy, decided not to abandon this stand.

Geographic cookies, in the outline of the states, for instance, may well be baked to take their place beside that established American institution, the animal cracker, says the American Bakers' Association.

Slow motion movies which show retail meat dealers how to make thirteen new cuts of lamb are available from the office of motion pictures of the Department of Agriculture. By this means it is hoped to popularize the sale of parts other than chops and legs.

Consumption per capita of meats and lard in the United States in 1928 was 152.7 lb., as compared with 153.5 lb. in 1927, according to figures of the Bureau of Agricultural Economics made public Nov. 8. Of this total, 51.7 lb. was beef, 6.8 lb. was veal, 5.6 lb. lamb and mutton, 73.9 lb. pork (exclusive of lard), and 14.7 lb. lard.

The malt sirup tax of the State of Michigan has netted a revenue of $300,000 in the first two months that it has been in force. The production of taxable malt, estimated from this return, is about 6,000,000 lb. Malt used by bakeries is exempt from this levy and not included in this figure.

Exports of manufactured foodstuffs in the third quarter of the year have shown a considerable increase. The group totaled $114,000,000, or one-eighth more than a year earlier. Noteworthy gains were made in meat products, fats and oils, wheat flour, canned and evaporated fruits, oil cake and meal. Imports of foodstuffs were only slightly larger than in the third quarter of 1928.

A Word To Production Executives

If you have a bacteriologist in your employ, or a chemist who serves in the dual capacity of chemist-bacteriologist, he should be sent to the meeting of the Society of American Bacteriologists at Ames, Iowa, on Dec. 30, 31 and Jan. 1, 1930. It is just as important for your scientific staff to attend these meetings of kindred minds as it is for you to attend your own trade conventions.

Canned tomatoes totaling 76,514,122 lb., valued at $4,310,175, were imported from Italy during the first nine months of 1929, according to the Department of Commerce. This is almost 90 per cent of the total import of this commodity in the period, and nearly twice the value of such imports in the same period in 1928.

Fishing banks off the coast of Maine annually produce 400,000,000 lb. of fishery products which are landed in this country, according to the Bureau of Fisheries. About 1,000,000,000 lb. of cod also taken on these banks are landed in the United States, Canada, Newfoundland, France and Portugal.

American manufacturers of canned and preserved foods will find it worth while to exhibit at the International Hygiene Exposition at Dresden, Germany, May 1 to Oct. 1, 1930, says A. T. Haeberle, U. S. Consul at Dresden.

Thirty million dollars will be paid out to growers of sugar beets by the Great Western Sugar Company this year, it is estimated. Because of excellent harvest conditions, a new slicing record of 40,000 tons of beets in 24 hours was recently established. Four large factories are each consistently slicing more than 3,000 tons per day.

Compulsory medical supervision of women workers in the candy industry, among others, is recommended by the Consumers League of Massachusetts.

The new cold-storage plant at Victoria, B. C., known as the Victoria Cold Storage & Terminal Warehouse Company, Ltd., has closed a contract calling for the storage, packing and shipping of 8,000,000 lb. of fish annually. The contract was made with the Island Packing Company, Ltd., which, since entering the fishing industry last fall, has installed a $500,000 plant for handling pilchard products and other fish. They will be brine-frozen, filleted, wrapped in waxed paper and inclosed in cartons for distribution.

Three co-operative creameries in Nebraska with a combined production of 10,000,000 lb. of butter per year have merged and intend to acquire such of the numerous small-unit creameries locally or co-operatively owned as fit into the program of expansion. Merging of the co-operatives is a countermove to the expansion plans of other large creamery enterprises.

Constitutionality of the law prohibiting the use of food containers stamped with the owner's name by another person without the owner's consent has just been upheld by the Ohio Supreme Court. A controversy over milk bottles led to the decision.

Utilization of culls is one of the three most important problems of the fruit industry, Dr. U. P. Hedrick, director of the New York State Agricultural Experiment Station, recently pointed out. Economic problems and need for better varieties were the other two. "Perhaps 50 per cent of the fruit produced in America goes to waste from preventable causes," he said.

A $400,000 bakery with a capacity of 4,000 loaves per hour has just been completed at Worcester, Mass., by the General Baking Company. This is one of the units in a comprehensive plan of the company which will require the expenditure of $8,000,000 for six new plants and the modernization of twelve others.

A large copra crushing mill is being erected at Wilmington, Calif., by the Vegetable Oil Corporation. It is planned to augment the plant at a later date with machinery for handling cottonseed, sesame seed and other products. The company is preparing to introduce two new shortenings to its present lines of refined coconut oil and margarins.

Canners are said to be planning a petition in Utah to postpone for two weeks the opening of schools. They assert that the sudden cut in the supply of labor for canneries and harvesting fields works a hardship upon them.

Shrimp will be frozen by the Atlantic Coast Fisheries Corporation this winter at the Jacksonville (Fla.) plant of the Armour Packing Company. It will be shipped to the Northern market. The Atlantic Coast Company recently made a very large shipment of frozen shrimp to Japan.

Revised pea pack statistics for the 1929 season show a United States production of 18,530,000 cases on the basis of No. 2 cans. The 1928 pack was 17,943,436 cases.

Condensed and Dried Milk Compared in Bread Test

THE flavor and taste of bread made with sweetened condensed skim milk and that made from dried skim milk cannot be distinguished from one another by the majority of observers, according to a test on 123 people recently made by the American Society of Bakery Engineers. A complete report of the test, in which 70 per cent of the observers either said that they could tell no difference or else made inconsistent comparisons, is contained in Bulletin 49 of the Society.

The experiments were made with both sponge and straight dough methods. The doughs used for the comparison were made on a commercial scale under shop conditions, care being taken to assure equivalent amounts of milk solids and sugar and similar handling.

Stored Frozen and Cured Meats Show Increase

THE TOTAL supply of frozen and cured meats in cold storage on Nov. 1 showed an increase of 82,998,000 lb. over stocks on hand at the same date last year, according to the Bureau of Agricultural Economics. Frozen poultry, totalling 86,854,000 lb., showed an increase of 28,761,000 lb., nearly 50 per cent over the 1928 figures.

Detailed figures as to the amounts in storage are given below:

Total meats, 630,716,000 lb., compared with 547,718,000 lb. Nov. 1, 1928, and a five-year average of 531,082,000 lb.

Frozen beef, 52,059,000 lb., compared with 41,635,000 lb. Nov. 1, 1928, and a five-year average of 35,855,000 lb.

Frozen pork, 75,678,000 lb., compared with 66,049,000 lb. Nov. 1, 1928, and a five-year average of 52,908,000 lb.

Frozen lamb and mutton, 4,989,000 lb., compared with 4,321,000 lb. Nov. 1, 1928, and a five-year average of 2,939,000 lb.

Cured beef, 8,833,000 lb., fully cured, and 11,234,000 lb. in process of cure, compared with 6,168,000 lb., fully cured, and 10,233,000 lb. in process of cure Nov. 1, 1928, and a five-year average of 19,720,000 lb. for both items.

Dry salt pork, 52,724,000 lb., fully cured, and 56,971,000 lb. in process of cure, compared with 49,368,000 lb., fully cured, and 51,755,000 lb. in process of cure Nov. 1, 1928, and a five-year average of 97,608,000 lb. for both items.

Pickled pork, 117,445,000 lb., fully cured, and 187,189,000 lb. in process of cure, compared with 97,118,000 lb., fully cured, and 167,870,000 lb. in process of cure Nov. 1, 1928, and a five-year average of 270,732,000 lb. for both items.

Miscellaneous meats, 63,594,000 lb., compared with 52,201,000 lb. Nov. 1, 1928, and a five-year average of 51,320,000 lb.

Lard, 99,110,000 lb., compared with 83,474,000 lb. Nov. 1, 1928, and a five-year average of 59,382,000 lb.

Total frozen poultry, 86,854,000 lb., compared with 58,093,000 lb. Nov. 1, 1928, and a five-year average of 56,835,000 lb.

Broilers, 22,370,000 lb., compared with 15,605,000 lb. Nov. 1, 1928, and a five-year average of 15,464,000 lb.

Fryers, 5,898,000 lb., compared with 4,469,000 lb. Nov. 1, 1928.

Roasters, 16,471,000 lb., compared with 12,025,000 lb. Nov. 1, 1928, and a five-year average of 14,871,000 lb.

Fowls, 11,964,000 lb., compared with 5,516,000 lb. Nov. 1, 1928, and a five-year average of 6,308,000 lb.

Turkeys, 3,714,000 lb., compared with 4,768,000 lb. Nov. 1, 1928, and a five-year average of 3,648,000 lb.

Miscellaneous poultry, 26,437,000 lb., compared with 15,710,000 lb. Nov. 1, 1928, and a five-year average of 16,544,000 lb.

S. H. Ayers Will Direct Food Process Research

A Department of Industrial Food Processes was recently established at the Pease Laboratories, Inc., New York City, under the direction of S. H. Ayers, formerly of the U. S. Department of Agriculture and more recently research director of the Glass Container Association. The addition of the new depart-

ment will enable the laboratories to handle all problems in the field of food processing, including those in the specialized field of processing at high temperatures.

Dr. Ayers will continue his connection with the research laboratories of the Glass Container Association in a consulting capacity.

PERSONALS

H. G. BUCK has been appointed assistant sales manager of the Whitefield Citrus Corporation. Mr. Buck was formerly associated with the Mavis Bottling Company and with Luden's, Inc.

H. B. FARLEY, formerly with the Fruit Products Laboratory of the University of California, now holds a position in the operating department of the California Packing Corporation. He left the University on July 1, and for a time was employed in a research capacity by the California Co-operative Producers.

CLARENCE GATES was recently appointed superintendent of the Maxwell House coffee plant in Brooklyn, N. Y. On Nov. 1, he was transferred from Orange, Mass., where he had been assistant superintendent of Minute Tapioca Company, another subsidiary of General Foods. G. Winkelmann continues as general superintendent of manufacture at the Richard Hellmann and Maxwell House plants.

C. E. GRAY, president of the Golden State Milk Products Company, San Francisco, Calif., has been appointed a member of the newly created State Board of Agriculture.

L. W. HOWELL, formerly vice-president and general sales manager of the Economic Machinery Company, is now associated with the Liquid Carbonic Company, Chicago, Ill.

H. J. KALTENBACH recently retired from his position as one of the vice-presidents of the Fleischmann Company.

W. W. KATENBRINK, of Rosenberg Brothers & Company, has been elected president of the newly organized Rice Millers' Association of California.

IRA B. LANPHIER of Madison, Wis., has been appointed director of the Package Research Laboratory, Rockaway, N. J. Mr. Lanphier was formerly at the Forest Products Laboratory of the Department of Agriculture at Madison. Part of his time will be devoted to the development of wire-bound boxes.

WESLEY M. OLER, JR., has retired as vice-president of the American Ice Company, New York City, having purchased a seat on the New York Stock Exchange. He will become a general partner in the firm of Norris & Kenly, Chicago stock brokers, and will have charge of the New York office.

HENRY C. SHERMAN, professor of food chemistry at Columbia University, was awarded an honorary degree of Doctor of Science on Oct. 31, at the 175th anniversary celebration at Columbia.

HARRY STINER, of the National Biscuit Company, returned to New York on the S.S. "Roma" on Nov. 8. He had been in Smyrna and Reshadie, Turkey, supervising fig packing and fumigation for the past three months.

FRED H. TAYLOR, president and general manager of Taylor's, Inc., Santa Ana, Calif., packers, has resigned. Mr. Taylor has been associated with the company since it was founded by his family forty years ago. LUCIAN FLIPPEN succeeds Mr. Taylor as president, and L. F. JORDAN has been elected vice-president in charge of operations.

HARDEN F. TAYLOR, vice-president of the Atlantic Coast Fisheries Company, is to give the Cyrus Fogg Brackett lecture at Princeton University on Dec. 10. His subject will be "Fish."

DONALD K. TRESSLER has resigned from the Mellon Institute, at Pittsburgh, Pa., and joined the scientific staff of General Sea Foods Company, at Gloucester, Mass. He will be chief of the chemical division. Dr. Tressler was formerly connected with the U. S. Bureau of Fisheries. He was editor of *Marine Products of Commerce* and is the author of "The Wealth of the Sea."

LLOYD S. TENNY has resigned his position as president of the Federal Fruit Stabilization Corporation of California to become manager of the Chicago Mercantile Exchange. Mr. Tenny went to California during the summer of 1928 as vice-president of the California Vineyard Association, leaving the position of chief of the Bureau of Agricultural Economics in the U. S.

Department of Agriculture. In May, 1929, upon the organization of the Federal Fruit Stabilization Corporation, Mr. Tenny was made president.

CORWIN WICKERSHAM, formerly division manager of the Fleischmann Company in New England, was appointed president of the Canadian branch of Standard Brands, Inc., on Nov. 1.

JUDGE CHARLES E. WINTER has been appointed solicitor of the Department of Agriculture to succeed R. W. Williams, who has been transferred to the Department of Biological Survey. He will supervise all law work for the department and act as legal adviser to the Secretary of Agriculture.

OBITUARY

EDWIN W. ALLEN, chief of the office of the experimental stations of the Department of Agriculture at Washington, died suddenly of heart disease on Nov. 11, while in Chicago, where he was to address the Association of Land Grant Colleges and Universities Convention. Dr. Allen entered the service of the Department of Agriculture in 1890 and was assistant director from 1893 to 1915, when he became chief of the office of the experimental stations. Since 1926 he had been editor of *The Journal of Agricultural Research.*

R. WILFRED BALCOM, chemist in charge of food control of the Food, Drug, and Insecticide Administration of the Department of Agriculture died suddenly on Oct. 17 in Washington. Dr. Balcom was born in Nova Scotia in 1877. He entered the service of the Department of Agriculture in 1907, and since that time had been continuously engaged in work on the chemistry of foods. He was the author of a number of scientific papers on this subject.

FRANK P. FAY, president of the Fay Fruit Company, Los Angeles, Calif., died Oct. 25 following a long illness. Mr. Fay, who was 66 years of age, was born at Columbus, Ohio. He moved to California in 1888 and entered into business with the Earl Fruit Company at Riverside, Calif. In 1900 he started the Fay Fruit Company at Los Angeles, and remained as its president until his death. In 1905 he was president of the California Citrus Union, one of the earlier attempts at co-operative marketing. At the time of his death he was vice-president of the California Vegetable Union.

CHAUVIN V. INDERRIEDEN, president of J. B. Inderrieden Company, food packers, died at his home in Chicago on Nov. 16. Mr. Inderrieden was 58 years of age. He was a son of J. B. Inderrieden, founder of the company.

EDWIN LE FEVRE, bacteriologist of the food research division of the Bureau of Chemistry and Soils of the U. S. Department of Agriculture, died in his laboratory in Washington on Oct. 25. He was long a student of pickle and sauerkraut fermentation and contributed a number of government bulletins and technical articles on the subject.

WILLIAM MOHLER, past president of the Indiana Bakers' Association, died on Nov. 7 as a result of injuries received in an automobile accident. Mr. Mohler, who was 53 years old, had been engaged in the baking industry in Indiana for twenty years.

WILLIAM HOMER PRIDE, 57, died at a Seattle hospital early in October. He had been associated in the establishment and operation of the W. H. Pride & Company's packing plant at Bellingham, Wash., for the greater part of his career.

THOMAS BARLOW WOOD, prominent English food authority, died at Norfolk, England, on Nov. 6. Dr. Wood, who held the Drapers Professorship of Agriculture in Cambridge University, was the author of "The Story of a Loaf of Bread," "The Chemistry of Crop Production," and other books on kindred subjects. He was 60 years of age.

· NEW · CONSTRUCTION ·

Factory and Equipment Requirements

Abattoir—E. F. Slayton, 525 Howard Ave., Orlando, Fla., plans the construction of an abattoir for slaughtering meats. Estimated cost $100,000. Architect not selected.

Bakery—General Baking Co., 420 Lexington Ave., New York, N. Y., had plans prepared for the construction of a 80 x 200 ft. bakery on Avery Ave., Detroit, Mich. $1,000,000. Also plans bakery at Allentown, Pa., $400,000. C. B. Comstock, 122 East 42nd St., New York, N. Y., is architect.

Bakery — Giusti Baking Co., 1385 Purchase St., New Bedford, Mass., plans the construction of a bakery on Purchase St. Estimated cost $50,000. Architect not selected.

Bakery—Hemmerdinger Estates Corp., Glendale, N. Y., awarded contract for the construction of a 2 story, 60 x 100 ft. bakery at Cooper Ave. and Dry Harbor Rd., to I. L. Wener, c/o Atlas Waste Co., Cooper Ave., Glendale. Estimated cost $40,000.

Bakery—Knott Baking Co., Muskogee, Okla., is having preliminary plans prepared for the construction of a bakery. Estimated cost $25,000.

Bakery, etc.—La Lilly Corp., A. K. Stresser, Pres., 411 4th Ave., New York, N. Y., plans the construction of a bakery, etc. Estimated cost $65,000. E. Djorup, 1345 Chrisholm St., New York, N. Y., is architect.

Bakery—E. Levitt, 3234 White Plains Rd., New York, N. Y., plans the construction of a 90 x 92 ft. bakery at 241st and Barnes Ave. F. J. Ross, 4200 White Plains Rd., New York, is architect.

Bakery—Queen City Baking Co., c/o C. M. Leslie, 107 Union Trust Bldg., Cincinnati, O., plans the construction of a 1, 2 and 3 story, 150 x 160 ft. bakery on Herold St. Estimated cost $250,000. Hillsmith & Co., Chamber of Commerce Bldg., Cincinnati, are engineers.

Bakery — Retailers Wholesale Bakery, Inc., Saulte Ste. Marie, Mich., is having plans prepared for a 2 story, 80 x 105 ft. bakery on Ashmun St. Estimated cost $50,000. Private plans. Equipment will be required.

Bakery—San Joaquin Baking Co., L and Los Angeles Sts., Fresno, Calif., plans the construction of a bakery at Stockton. Estimated cost to exceed $40,000.

Bakery—Wehle Baking Co., 181 Sheldon Ave., New Haven, Conn., is having plans prepared for the construction of a 2 story, 70 x 250 ft. bakery at Fitch and Whalley Aves. Estimated cost $125,000. W. E. Long Co., 155 North Clark St., Chicago, Ill., is architect.

Bakery — Winfield Fisher, 2105 Lyle Ave., Waco, Tex., plans the construction of a 2 story, 100 x 150 ft. bakery, 50,000 loaves bread daily capacity. Estimated cost $100,000. R. E. Lane, 106½ South 6th St., Waco, is engineer.

Bakery—Van de Camps Holland Dutch Bakery Inc., L. L. Frank, Pres., San Fernando Bldg., Los Angeles, Calif., is receiving bids for a 4 story, 150 x 200 ft. bakery at Orange Dr. and Willoughby St. and Romaine Ave. Estimated cost $500,000. McCormick Co., 41 Park Row, New York, N. Y., is architect.

Bakery Addition—Cliffside Park Construction Co., 356 Palisade Ave., Cliffside, N. J., will build a 2 story, 25 x 100 ft. addition to bakery at Greenmount and Anderson Aves. Estimated cost $40,000. Work will be done by separate contracts. Lucht & Anderson, 432 Palisade Ave., Cliffside, N. J., are lessees.

Bakery Addition — Teitelbaum Baking Co., Parkside and East Rogers Aves., Brooklyn, N. Y., is receiving bids for the construction of a 2 story addition to baking plant. Estimated cost $40,000. E. J. Robin, 415 Lexington Ave., New York, is architect.

Bakery Unit, Coffee Roasting Plant, etc.—J. Weingarten, Inc., c/o A. Weingarten, Mgr., Houston, Tex., is having plans prepared for the construction of a food production plant, including bakery unit for preparing delicatessen supplies, also coffee roasting plant, etc., at Navigation Blvd. and Lockwood St. Estimated cost $125,000. J. Finger, Democratic Bldg., Houston, is architect.

Bottling Plant—Coca Cola Co., C. Duncan, Mgr., 55 Vine St., Hamilton, Ont., will soon award contract for the construction of a 100 x 100 ft. bottling plant.

Bottling Plant—L. P. Croce, Inc., 930 Summerfield Ave., Asbury Park, N. J., will build a 1 story bottling plant. Estimated cost $40,000. C. B. Cook, Asbury Park Trust Bldg., Asbury Park, is architect. Work will be done by separate contracts.

Bottling Plant—G. Desha, Brownsville, Tex., will soon award contract for a 2 story, 30 x 80 ft. bottling plant at St. Charles St. between West 3rd and West 4th St. Private plans.

Bottling Plant—Dr. Pepper Bottling Co., 104 13th St., San Antonio, Tex., plans a new bottling plant at Dallas and North St. Marys Sts. Estimated cost $100,000. Private plans. Complete equipment will be required.

Bottlers Supply Factory — Liquid Carbonic Corp., 4238 24th St., Detroit, Mich., awarded contract for the construction of a 1 story, 46 x 125 ft. factory for the manufacture of carbonic gas and bottlers supplies, to Cooper Little Co., 5057 Woodward Ave., Detroit. Estimated cost $40,000.

Candy Factory — W. M. Hardie Co., O. Grossenbacker, Secy. and Treas., 2260 East 69th St., Cleveland, O., plans the construction of a candy factory on East 19th St. and Payne Ave. Estimated cost $150,000. Architect not selected.

Candy Factory—J. Merrill, 54 Devonshire St., Boston, Mass., awarded contract for addition and alterations to factory to C. Brown, 1947 Washington St., Boston. Estimated cost $40,000. Manhattan Chocolate Co., lessee.

Candy Manufacturing Plant — Gold Brand Confectionery Co., 75 Beverly St., Boston, Mass., awarded contract for the construction of a manufacturing plant, boiler room addition and loading platform to B. Steinberg, 6 Beacon St., Boston, Mass. Estimated cost $40,000.

Canning Plant — Frontier Canning Co., L. Holmes, Robbinston, Me., is having plans prepared for the construction of a 2 story, 40 x 200 ft. canning plant to replace fire loss. Estimated cost $60,000. Private plans.

Canning Factory — Midwest Canning Co., Rochelle, Ill., c/o E. Rader, Sleepy Eye, Minn., will soon receive bids for superstructure of a group of buildings including 1 story, 65 x 400 ft. warehouse, 88 x 170 ft. factory, 78 x 170 ft. retort building, 3 story, 88 x 120 ft. pea factory, etc. Estimated cost $400,000.

Canning Plant—Southland Citrus Fruit Co., G. R. McKay, Guard Bldg., Cleveland, O., plan a 3 story, 60 x 160 ft., addition to canning plant at Lakeland, Fla.

Canning Plant (Vegetable)—Grigg, Canneries, c/o Medina Valley Growers Assn., Natalia, Tex., will build a tomatoe and bean canning plant. Estimated cost $45,000. Private plans. Work will probably be done by day labor. Complete equipment will be required.

Canning Plant Equipment—Canadian Packers, Burford Rd., London, Ont., interested in prices complete equipment for recently acquired plant.

Salmon Storage Terminal—Seattle Port Commission, Seattle, Wash., will soon receive bids for the construction of a salmon storage terminal including four transit sheds, each 450 ft. long and 90 ft. wide at Smith Cove.

Creamery—Fairmont Creamery Co., 12th and Jones Sts., Omaha, Neb., awarded contract for the construction of a 2 story, 102 x 139 ft. creamery at Lawton, Okla. to Schafer-Reynolds, Inc., 915 North Hudson St., Oklahoma City.

Creamery and Produce Plant — Miller & Holmes, 18 East 3rd St., St. Paul, Minn., awarded contract for a 3 story, 62 x 120 ft. creamery and produce plant at Lafayette and Grove Sts. to C. Skooglun, 502 Ryan Annex, St. Paul. Estimated cost $80,000.

Creamery Plant—Laney Creameries, 410 Chestnut St., San Antonio, Tex., is having plans prepared for the construction of a creamery plant to convert sweet cream into butter at Nixon. Estimated cost $45,000. Pricate plans.

Creamery Plant — H. R. Post, Breckenridge, Tex., plans the construction of a creamery plant at Fort Stockton. Estimated cost $50,000.

Dairy, Butter and Refrigeration Equipment — Bighams Ltd., R. B. Bigham, Mgr., Thames St., Ingersoll, Ont., interested in prices complete new equipment for dairy and butter business, also bottling, cleansing and refrigeration equipment for recently acquired factory.

Dairy Plant — E. Hohneker, 563 30th St., North Bergen, N. J., is receiving bids for a 2 story, 75 x 120 ft. dairy plant. Estimated cost $40,000. F. J. Ricker, 685 Hudson Ave., West New York, N. J., is architect.

Dairy Products Plant and Cheese Factory—Kraft-Phoenix Cheese Corp., 400 Rush St., Chicago, Ill., will build a dairy products plant at Denison, Tex. $100,000. Work to be done by owners forces, also plans a cheese plant at West Jefferson, N. C. $100,000.

Dairy Products Plant—State Dairy Products Co., Columbia, Mo., is having preliminary plans prepared for the construction of a dairy products plant at Jefferson City. Estimated cost $85,000.

Ice Cream Plant — Arctic Ice Cream Co., 3301 Grand River Ave., Detroit, Mich., is having plans prepared for the construction of a 2 story ice cream plant on Wildwood Ave. Estimated cost $150,000. Private plans.

Ice Cream Plant—N. T. Cochran, Petroleum Bldg., Oklahoma City, Okla., is having preliminary plans prepared for the construction of an ice cream plant at Ada. Estimated cost $25,000. Private plans.

Ice Cream and Milk Plant—Louisiana Ice & Utilities Co., 402 Securities Bldg., Baton Rouge, La., will soon award contract for a 2 story, 50 x 60 ft. ice cream and milk plant. S. Stone Jr. & Co., Masonic Temple Bldg., are architects.

Milk Plant—Chamber of Commerce, Ruston, La., is having preliminary plans prepared for the construction of a milk plant three miles west of Ruston. Estimated cost $100,000. Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., is engineer.

Milk Plant—Milk Products Co., Hiawatha, Kan., plans the construction of a 1 and 2 story milk plant. Estimated cost $200,000. Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., is engineer.

Milk Plant—Silverwoods, Ltd., 1 Jarvis St., Toronto, Ont., will soon award contract for the construction of a 2 story, 50 x 100 ft. milk plant, to include test laboratory, refrigeration plant and plant for washing bottles and milk cans. Estimated cost $100,000. Watt & Blackwell, Bank of Toronto Bldg., London, are architects. Complete equipment will be required.

Milk Plant—Texas Milk Products Co., c/o M. Turner, Pres., Mount Pleasant, Tex., will soon award contract for the construction of a milk plant. Estimated cost $200,000. Douthitt Engineering Co., 100 West Monroe St., Chicago, Ill., is engineer.

Milk Plant — Southwest Dairy Products Co., c/o H. C. Vandervort, Dist. Mgr., San Angelo, Tex., will soon receive bids for the construction of a milk plant. Estimated cost $85,000. Private plans. Complete machinery and equipment will be required.

Cold Storage Plant—J. J. Harder, Inc., Trades National Bldg., Oklahoma City, Okla., is having preliminary plans prepared for the construction of a 4 story, 130 x 200 ft. cold storage plant on Reno St. Estimated cost $350,000. Private plans.

Cold Storage Plant—Central Power & Light Co., c/o F. C. Ludden, Dist. Mgr., San Benito, Tex., will soon award contract for the construction of a 3 story, 54 x 70 ft. cold storage plant. Private plans.

Cold Storage Warehouse, etc. — The Great Atlantic & Pacific Tea Co., 420 Lexington Ave., New York, N. Y., plans the construction of a cold storage warehouse for meat storage at Buffalo, also awarded contract for a 2 story, 150 x 150 ft. warehouse at Pittsburgh, Pa., to N. C. Hubbell, 7180 First National Bank Bldg., Cincinnati, O.

Cold Storage Plants, Warehouse, Stock Yards, etc.—Swift & Co., Packers and Exchange Aves., Chicago, Ill., plans the construction of a cold storage plant at McAllen, Tex., also awarded contract for a 3 story, 75 x 110 ft. cold storage plant at Yoakum, Tex., to J. T. Taylor, First National Bank Bldg., Fort Worth, $50,000, and 2 story, 50 x 75 ft. warehouse at Johnstown, Pa., to Carstensen & McLain, Swank Bldg., Johnstown, $30,000. Will build stock yards at Cherokee, Ia., with local labor, $40,000.

Cold Storage Plant, etc.—United States Cold Storage Warehouse Co., 2101 West Pershing Rd., Chicago, Ill., plans the construction of an office building and cold storage warehouse at Atlanta, Ga. Estimated cost $2,000,000.

Ice and Cold Storage Plant and Ice Cream Factory—Arledge Bros., Rochester, Tex., plans the construction of a 35 ton ice and cold storage plant, also ice cream factory at Raymondville. Estimated cost $75,000. Private plans. Machinery and equipment will be required.

Ice Manufacturing Plant—Fairfield County Ice Co., Stamford, Conn., awarded contract for the construction of an ice manufacturing plant to Sullivan & Tymon, 34 Bedford St., Stamford.

Ice Manufacturing Plant—Monterey Ice Delivery Co., Monterey, Calif., will build an ice manufacturing plant. Estimated cost including equipment $50,000. Work will be done by day labor.

Ice Plant — American Ice Co., 121 North Broad St., Philadelphia, Pa., awarded contract for the construction of a 1 story, 143 x 148 ft. ice plant at 18th St. and Limekiln Pike to Sutton & Stephenson, 1307 Washington Ave., Philadelphia.

Ice Plant—Banner Ice & Ice Cream Mfg. Co., Coleman, Tex., awarded contract for the construction of a 20 ton ice plant, electrically operated, to Edgerton & Furrey, Coleman. Estimated cost $45,000.

Ice Plant—Boston Ice Co., 11 Deerfield St., Boston, Mass., is having preliminary plans prepared for the construction of an ice plant on East Eagle St., East Boston, Mass. Estimated cost $40,000. Private plans.

Ice Plant—L. A. Brown, Lazana, Tex., plans the construction of a 20 ton ice and cold storage plant at San Perlita near Raymondville. Estimated cost $30,000. Private plans. Machinery and equipment including coolers, cutter machine, electric unit, etc. will be required.

Ice Plant—Central Power & Light Co., Frost Bldg., San Antonio, Tex., plans the construction of a 30 ton ice plant at Raymondville. Estimated cost $45,000. J. Marriott, Frost Bldg., San Antonio, is architect.

Ice Plant — City of Coleman, Tex., F. W. Taylor, Comr., is having plans prepared for the construction of a municipal ice plant. Estimated cost $125,000.

Ice Plant—Crosby Ice Plant, C. R. Waters, Crosby, Tex., is having preliminary plans prepared for the construction of a 12 ton electrically operated ice plant. Estimated cost $28,000.

Ice Plant—Fisher Ice Mfg. Co., San Perlita, Tex., is receiving bids for the construction of a 2 story ice plant. Estimated cost $60,000. Private plans.

Ice Plant—Holler Ice Mfg. Co., Reeds Mill Lake and Hollers Ave., New York, N. Y. had plans prepared for a 1 story, 80 x 150 ft. ice plant. Sibley & Fetherstone, 205 East 42nd St., New York, are architects.

Ice Plant—Knickerbocker Ice Co., 41 East 42nd St., New York, N. Y., had plans prepared for the construction of a 1 story, 54 x 85 ft. ice plant at Proctor St. and Edsall Ave. Private plans.

Ice Plant—Metropolitan Ice Co., 321 Washington St., Somerville, Mass., will soon award contract for addition and alterations to ice plant on Leland St. Estimated cost $60,000. B. Gundlach, 597 5th Ave., New York, N. Y., is architect. R. B. Engineering Corp., 11 West 42nd St., New York, N. Y., is engineer.

Ice Plant—Rubel Coal & Ice Co., 937 Fulton St., Brooklyn, N. Y., will receive bids after Dec. 10, for the construction of an ice plant at 21st St. and Neptune Ave., also plans addition to ice plant at India wharf and Conover St. Estimated cost $90,000 and $40,000 respectively. H. J. Nurick, 44 Court St., Brooklyn, is architect.

Ice Plant—C. William, Fort Stockton, Tex., plans the construction of a 20 to 25 ton ice plant at Bakersfield, near Girvin. Estimated cost $30,000. Private plans.

Ice Storage Building, etc.—Southern United Ice Co., McComb, Miss., will build a 1 story, 64 x 100 ft. ice storage building and docks. Estimated cost $175,000. Work will be done by local labor.

Ice House Extensions—Western Railway Ice & Refrigeration Co., c/o W. E. Daly, Mgr., Alamosa, Colo., has work under way on extensions and improvements to ice house to increase capacity from 30,000 to 42,000 ton capacity, also increasing car icing facilities from 16 to 32 cars, etc. Estimated cost $75,000.

Refrigeration Plant—East Coast Refrigerating Co., D. C. Smith, Pres., Lake Worth, Fla., plans the construction of a 2 story, 60 x 130 ft. refrigeration plant. Estimated cost $80,000.

Food Products Warehouse—The Great Atlantic & Pacific Tea Co., Auckland St., Dorchester, Mass., awarded contract for the construction of a warehouse on Kennebec St., Portland, Me. to F. A. Rumery Co., 533 Forest St., Portland, Me. Estimated cost $200,000.

Food Products Factory—McCann & Co., Market St., Pittsburgh, Pa., plans the construction of a food products factory at Highland and Broad Sts. Architect not selected.

Grocery Warehouse — Twin City Wholesale Grocery Co., O. G. Zimmerman, Secy., 2295 University Ave., St. Paul, Minn., plans the construction of a 4 story warehouse at University Ave. and La Salle St. Estimated cost $150,000. Ellerbe & Co., 692 Endicott Bldg., St. Paul, are architects.

Sausage Factory — A. Koegel Co., 116 West Kearsley St., Flint, Mich., will soon award contract for the construction of a 2 story, 72 x 167 ft. sausage factory on Stevens St. Estimated cost $65,000. P. Henschien, 1637 Parie St., Chicago, Ill., is architect. Machinery and equipment will be required.

Cereal Mill—Tennessee Cereal Co., B. W. Ernst, Pres., Nashville, Tenn., plans the construction of a 4 story mill.

Feed Mill—Taylor Grain Co., c/o S. Taylor, Van Alstyne, Tex., has work under way for converting flour mill into feed mill to include Bowser hammer mill, 10,000 lb. ear corn per hr. capacity, electrically operated, also 10 ton mixer, etc. Machinery and equipment for the manufacture of sweet feed will be required (later).

Flour Mills—Union Socialist Soviet Republic, Russia, awarded contract for the construction of five flour mills at various locations to MacDonald Engineering Co., 53 West Jackson Ave., Chicago, Ill. Estimated cost to exceed $50,000,000.

Grain Elevator—Canadian Terminals System, Ltd., 34 King St. E., Toronto, Ont., plans the construction of a grain elevator, 3,000,000 bu. capacity at Meaford. T. A. Neeley, c/o owner, architect.

Grain Elevator — Dept. of Public Works, Ottawa, Ont., awarded contract for the construction of a grain elevator at Lake Terminal, Prescott, to Atlas Construction Co., 37 Belmont St., Montreal, Que. Estimated cost $3,093,000.

Grain Elevator—Famo Feed Milling Co., 429 Cherokee St., St. Joseph, Mo., awarded contract for a 31 x 32 ft. grain elevator to Industrial Engineering Co., 620 Kansas City Life Bldg., Kansas City, Mo. Estimated cost $40,000.

Grain Elevator—Galveston Wharf Co., 2324 B. St., Galveston, Tex., awarded contract for building for grain elevator to Jones Hettelstater Co., 708 Mutual Bldg., Kansas City, Mo. Estimatead cost $1,000,000. Other contracts involving elevator proper will be awarded later.

Grain Elevator—Riffe Bros., Stratford, Tex., will build a grain elevator, 150,000 bu. capacity. Estimated cost $70,000. Work will be done by owner's forces.

Grain Elevator — Western Flour Mills of Davenport, Ia., work under way on the construction of a grain elevator 420,000 bu. capacity. James Stewart & Co., 343 South Dearborn St., Chicago, Ill., Contr.

Grain Elevator—Western Grain Co., 1716 10th Ave. N., Birmingham, Ala., awarded contract for the construction of a 4 story, 45 x 80 ft. grain elevator to Southern Construction Co., Inc., 615 South 11th St., Birmingham.

Packing Plant — American Fruit Growers Assn., San Fernando, Calif., awarded contract for a 2 story, packing plant to W. L. Collins, 812 Porter Ave., San Fernando. Estimated cost $55,000.

Packing Plant—Armour & Co., 324 17th St., Jersey City, N. J., is having plans prepared for a 2 story addition to packing plant. Estimated cost $150,000. Architect not announced.

Packing Plant (Meat)—Batchelder & Snyder Co., 55 Blackstone St., Boston, Mass., will soon award contract for additions and alterations to meat packing plant, at 79-81 Blackstone St. Estimated cost $50,000. E. T. P. Graham, 171 Newbury St., Boston, is architect.

Packing Plant — West Philadelphia Stock Yards Co., Race St., Philadelphia, Pa., will receive bids until Dec. 2 for the construction of a 6 story packing plant at Grays Ferry Rd. Estimated cost $1,000,000. C. B. Comstock, 110 West 40th St., New York, N. Y., is architect.

Packing Plant Addition—F. G. Vogt & Sons, 30th and Race Sts., Philadelphia, Pa., will receive bids about Dec. 2 for addition to packing plant at 36th St. nad Grays Ferry Rd. Estimated cost $1,000,000. C. B. Comstock, 110 West 40th St., New York, N. Y., is architect.

Produce Plant—R. E. Cobb Co., 2 East 3rd St., St. Paul, Minn., awarded contract for the construction of a 2 story, 100 x 150 ft. produce plant including refrigeration system, etc. to Paul Steenberg Constr. Co., 914 Builders Exchange Bldg., St. Paul. Estimated cost $125,000.

Produce Plant — Swift & Co., Packers and Exchange Aves., Chicago, Ill., awarded contract for the construction of a 3 story, 76 x 130 ft. produce plant at Ardmore, Okla. to James T. Taylor First National Bank Bldg., Fort Worth, Tex. Estimated cost $150,000.

Produce Terminal — Dept. of Markets, T. F. Dyer, Comr., Municipal Bldg., New York, N. Y., plans a 5 story produce terminal at Flushing and Clinton Aves. and Metz St., Brooklyn. Estimated cost $3,000,000.

TWO SECTIONS—SECTION TWO

MARKETING SECTION TO

FOOD INDUSTRIES

H. C. PARMELEE, *Editor*

New York, November, 1929

VOLUME I . . . NUMBER 14

Distribution—Has Anyone Solved It Yet?

MORE economical distribution is engaging the major attention of executives in all branches of industry. The situation is especially acute in food. Lately public attention has been forcibly called to the shortcomings of food distribution.

National advertising brought new forces into the wholesaling and retailing of foods. Chains spread their price challenge throughout the land. Big packers have asked permission to use their far-flung organization for distributing foods other than packing house products. Food manufacturers have started a seemingly incoherent series of mergers which bring together apparently unrelated grocery products; and they announce the purpose to be more effective distribution. Whether the old system was good or bad it has been put out of balance so far by these happenings that it must fall or else step out of the comfortable rut in which it has been walking.

You are deeply interested in distribution. So are we. Will you co-operate by giving us a frank statement of your views on these thoughts that present to you, in a preliminary way, some of the fundamentals of distribution and merchandising? Your comments will be a guide to further supplements.

In the United States over 49,000 establishments in 1927 manufactured nearly $11,000,000,000 worth of food products. Twenty per cent of the manufacturers of foods produce 90 per cent of the total volume of manufactured foods. Outlets for this vast amount of food exceed 500,000 in number, including wholesalers, grocery stores, chain stores, delicatessen stores, and other retailers selling food as their principal business.

Against this production, consumption is spread wherever there are people. Retail service is better the nearer it gets to its consumers, but each step of concentration takes it further away from individual customers. Yet each step of concentration makes administration easier. Somewhere there is an optimum balance. It has not been studied deeply, but the chains have gone farthest in investigating size efficiency. They report that they find definite points beyond which it does not pay to concentrate and increase sales in a single retail unit, and points below which a store cannot be profitable. Chains can close stores that are too small, but independents cannot. It is success or failure, with each independent retailer. He has more at stake. The cold laws of economics in their clumsy way have tended to kill off the stores too big or too little and to allow the fittest to survive. Economic law acts slowly, and in these fast-changing times the inefficient have not been cleared away quickly enough. The old channels are clogged with sinking derelicts.

Choice of lines to carry has been a "hit-or-miss" problem. It depended more on the wholesaler's salesman and his ability to sell, than on any other factor. That, perhaps, is one of the principal reasons why the chains have been able to attain high efficiencies in comparison with old-line distributors. They choose their lines carefully. They eliminate slow movers. They study consumer habits, and prepare and pack their wares in ways that are convenient for the consumer. They have substituted direct distribution for "hit-or-miss" distribution.

For a time the chains bought more favorably than the other distributors. They hired skillful purchasing agents who knew how to make the most of their volume in securing price concessions. There is a limit to that advantage, however. If they bear down too hard on their supplier they put him out of business. That did not matter when chains were small and few in number. There were plenty of other suppliers. Independents saw through the move and formed buying co-operatives. Manufacturers also made compensatory moves and stiffened their backbones against chain purchasing agents, or formed mergers which could dictate to the chains.

Mergers become inefficient after they get too big. Chains find it harder to keep down costs, the bigger they get. The independent has advantages that cannot be duplicated in chain organizations, and vice versa. Perhaps the chain can serve best the distribution of fast-moving standardized staples. Perhaps the independents can serve best the distribution of foods in which consumers look for special qualities. Perhaps a new distribution system will evolve in which those distinctions will be recognized in differences in the lists of items carried in the different types of stores.

Consumer, Not the Goods,

The Raw Material of Distribution

By O. H. CHENEY
Vice-President, Irving Trust Company, New York

ONE OF THE SAD—I might say, tragic—confusions of modern business is the eagerness to accept any new merchandising development as *the modern* method of distribution—as the panacea for all our distribution troubles. Every new selling wrinkle, every elaborate sales system, every farm relief plan, almost every new financing in the merchandising field, is hailed as "the modern method of distribution." For years I have been looking for *modern* methods in merchandising and I have not found one.

What are modern methods? Battles are being fought on the doorstep and across the counter, in conventions and in legislatures, over modern methods of distribution. Whole systems of new economics are being invented to explain modern methods—systems that usually merely confuse the inventor and hide from him the vital defects and disguise functions and costs. In some of the new plans the middleman is eliminated in one grand sweep as a means of cutting the cost of distribution.

But, although the world is eager for relief from distribution waste and will give liberally in ingenuity and faith and money for any new project which promises anything, and although millions are being invested in modern methods of merchandising, I believe that the search for radically new machinery of distribution will not be rewarded for many years, if ever.

Some new scheme, some new machinery usually is meant by the phrase "modern methods." So much attention has been paid to new schemes, so much hope and fear and anger have been expended on them, that we have forgotten the distinction between machinery and methods. I do not believe that we ever will have anything that resembles a revolution in distribution in the way it is being pictured by so many of us. We shall be fortunate, indeed, if we can successfully combine existing methods so that the result will be a profit.

THERE are two reasons why I refuse to daydream about wonderful new methods that some day may be discovered for revolutionizing distribution. One reason is that the popular concept of an industrial revolution is as inaccurate as are most popular concepts. The industrial revolution was wonderful—but not magic. It was the result of the efforts of many men who thought hard and worked hard—men who recognized the significance of those details out of which grew great principles. The other reason is that the basic principles of production and distribution are so different that only the most general principles of development and improvement can be applied to both.

We are told that what we need is "mass distribution"—that just as mass production has transformed manufacturing through efficiency, so can distribution be transformed. But it is very confusing to make mass production synonymous with efficient production, for efficiency is not necessarily the result of mass production. The secret of the present high degree of efficiency of American production is not the brute power of size, but *control and management,* and in them is the only hope for meeting competition and putting distribution on the same basis as production. Reduction of distribution costs will be effected more by increasing the efficiency of present methods than by torturing them into forms which appear new, or can be talked up as being new.

THE first principle that hits even a blind observer of distribution, and of American economics in general, is, of course, size. Our minds have become calloused to size—nothing is too big for us. If a small store is profitable, say the extreme exponents of super-economics, a store twice the size will be more profitable, and two stores will be more profitable. This is the theory behind the big department stores and chains.

Speed is the other principle behind a majority of these developments. It is a natural teammate of volume. Speed expresses itself in means for stimulating turnover and in shortening the route between producer and consumer. Direct selling to retailers or even consumers, mail selling, co-operative marketing, everything from a roadside apple stand to the giant mail-order houses, is hailed as conferring on humanity the blessing of eliminating the middleman.

Organization is another characteristic of all these developments. Better organization means more efficient operation and greater profits. Everything is routinized and mechanized. There is a system for everything.

Who can deny that size, speed, and organization are sound principles upon which to base the betterment of distribution? Surely with these principles waste can be ended, and in their proper development lies the end of all distribution difficulties. But the recent history of any of the big developments in merchandising is an amazing revelation of the wide gap between theory and practice in distribution.

The history of the mail-order business is not only an epic of achievement—it is also one of the great comedies of business. I don't think that even the wildest witch hunters of Salem ever hated witches more eloquently than the small town merchants hated the mail-order ogres—nor did the witch hunters ever dance with greater glee around a burning witch than the small local chambers of commerce around a pile of flaming mail-order catalogs. In spite of the annoyances of this unfair competition, the mail-order houses grew into tremendous distribution organizations. Why? Because their method filled the needs of certain groups of consumers. Some of the retailers have learned the lesson and have developed substantial mail-order businesses of their own.

The mail-order method is sound—for certain groups of consumers—but if the mail-order distributors want to increase their volume and reach other consumers, they must use other methods—even the old-fashioned retail store, which they were supposed to have made quite obsolete and killed off.

But that is only one example. Surely the chain-store systems are growing by leaps and bounds, and mergers—surely in them distribution becomes more and more concentrated and centralized. There again, we must look below the outward structure. More than one of the big chains is wrestling with the problem of decentralization and working out plans whereby the local managers and local organizations are given more power and more control. Why? Because they are nearer the consumer and because the far-sighted builders of chain systems have come to realize that there are very grave limitations to centralization.

And not only is this trend beginning to be marked in retail distribution—we find it also in the selling systems of manufacturers. In two such widely different fields as rubber products and crackers, the outstanding companies have worked out plans for deliberately decentralizing sales power and responsibility. It isn't only that buying habits and tastes differ in different parts of the country, but that there are limits to the strength of organization when the threads are spun out too far.

Strange as it may seem, the opposite trend is revealing itself as of importance, in the case of buying as distinguished from selling. The scattering of small orders by retailers among innumerable manufacturers and jobbers has come to be recognized as an all-around waste. Where is the modern method here? In what is its modernity? Which method will win? Did the mail-order house win? Is the chain-store system winning? Did the retail store defeat the peddler many years ago? What about house-to-house canvassing? Didn't the specialty shops in growing towns put the general store out of business? But what about the department stores and the variety stores? Is the merchandising principle essentially different because the general store offered its customers a seat on the cracker barrel nearer the iron stove and the great modern department store offers them luxurious lounges and an air-cooling system? Which will win in the cigarette fight, the tobacco store or the grocery store? Which will win when, in a few years, nobody will be able, with the naked eye, to tell the difference between a drug store, a grocery store and a tobacco store, because all of them will be restaurants?

THE CHAIN SYSTEM on one side and the wholesaler and the independent retailer on the other have more in common than they have differences. The biggest problems of each of them are not those connected with the competition between them. The biggest problems of each are those which would be problems even if the other competitor did not exist. And the problems of none will be solved until the problems common to all are solved. That is why the warfare between the chains and the independents and their wholesalers has about as much sense and constructive value as that between witches and witch hunters in the good old days. That is why trying to get the Federal Trade Commission or the state legislature to remove the competition of the chain stores will not help the independents.

The picture of the poor independent beset by the villainous chain is a moving one, but somehow the theme song is getting a little monotonous. Even when the development of the voluntary chains of independents is completed—and these, in their various forms, seem to be the logical answer to the challenge of the chains—even then the fundamental problems will continue.

I think it would be more profitable for those concerned with distribution to devote less energy to seeking a modern method in the sense of a system, type of organization, or machinery, and to devote more thought and effort to working out improvements in the operating methods of these systems. Every system of distribution has its advantages—every system has its disadvantages. Every system has limitations beyond which development is economically unsound. Within those limitations there is in every system a vast field for improvement which should be the great objective of every one in the system.

Those thousands of merchandising units that have failed since buying and selling began, failed in most cases not because their system was wrong but because they did not make their operations efficient.

THE ACHIEVEMENT of efficient production is the work of patient pioneers like Taylor, Barth, Gantt, Emerson, the Gilbreths and Szepesi, and of the executives who dared to apply the principles which they formulated. These men achieved the miracle of tremendous volume by toiling solicitude for the unit—more, for the smallest possible part of the unit. They built great plants with the stop-watch and the microscope. They achieved billion-dollar volumes by measuring thousandths of an inch Their first principle was knowledge—they studied materials and operations and men—and no detail was too small for study. They studied every process and every motion, and every small element of movement that makes up a motion.

Can this principle be applied to distribution? It can. The methods of research and statistical control are being applied to merchandising. Most business men are still afraid of a chart, but an increasing number are becoming chart worshippers. There, again, is danger. The bigger a distributing organization grows, the more facts it seeks out; the greater its knowledge, the more intricate becomes the systematizing and utilization of that knowledge. Remarkable devices have been developed to help the clerical and routine worker, but executive management is still in the pre-machine age. Management—progressive modern management—is threatened with being buried under facts and figures and charts. Perhaps some form of mechanization along the lines of dynamic graphic control may prove to be the salvation.

Beyond the application of these principles of knowledge and planning, the problems of production and distribution diverge. The basic difference is not in operations—these can be organized. The greatest difficulty is in personnel—and materials. After all, we must recognize the fact that the "raw material" of distribution is not the goods but the consumer. It is the buying consumer who must be wrought out of the undifferentiated mass of the millions of indifferent and non-buying people. Why do people buy? How do they buy? Where do they buy? Until distributors seek the true and complete answers to these questions, distribution problems will remain unsolved.

As distribution units grow bigger and bigger, there is a new faith which must be kept. The air has been filled with loud discussions of mass-buying power and how it must inevitably dominate distribution—and therefore production. I should like to remind everyone that nowhere

(*Continued on page 8*)

Analyzing Recent Trends In Distribution of Foods

By E. G. MONTGOMERY
Chief Foodstuffs Division
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THE LARGEST industry in the United States is the production and distribution of foodstuffs. It is roughly estimated that probably one-fourth of the national income is spent in the retail food stores of the United States. As the national income is around $90,000,000,000, this would indicate that some $22,000,000,000, more or less, is spent for food. Back of this expenditure, of course, lies an enormous industry, such as the production of raw materials on the farms, the further processing of a certain part of these food products, and then the wholesale and retail distribution.

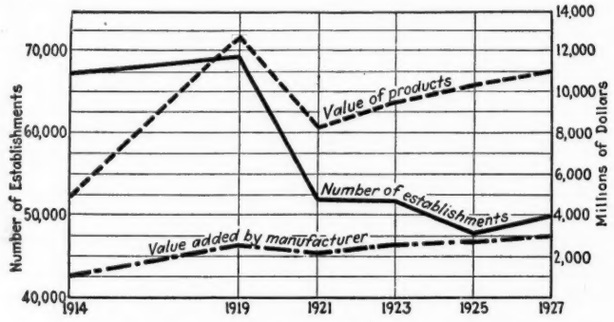
In a general way the value of the raw food products on the farms is about $10,000,000,000 annually. Some $7,500,000,000 worth of these products are further processed and an additional value of about $2,500,000,000 is added by the processing. Some of these products are further manufactured, such as conversion of flour into baked goods, or the products are packaged, and finally put into retail channels. All of this—the production, processing and distribution of food products—furnishes employment to probably one-third of the population. Therefore, any change in the method of manufacture or distribution has a direct effect on a large part of those engaged in the industry, and also is of indirect interest to all of the consumers whose products may be increased or decreased in price as a result of these changes.

Tendency Toward Merging for Distribution—The most interesting change that has been going on during the past 15 years is the merging of producing, manufacturing and distributing groups into larger and larger units. Many questions have arisen as to just what economic effects these mergers are having and who is most concerned as a result.

If we go back 20 or 25 years it will be found that both the manufacture and distribution of foodstuffs were handled by thousands of independent units. Small manufacturers, wholesalers and retailers were almost as independent as the proverbial American farmer, owning their businesses and carrying them on to suit themselves. The whole industry was on a highly competitive basis and the people engaged in it were individualistic and, to a large extent, not co-operative.

Merging began with the producing and retail end when the first farm co-operatives and chain-store systems were set up. Little attention was paid to the chains at first, but they grew stronger in time; other chain systems started up, and finally in recent years we have seen the gradual merging of chain systems into larger and larger units. In the same way farm co-operatives started with small independent units. These have been merging gradually into larger units, as for example, the Land O'Lakes dairies, and now the Federal Farm Board announces its policy of fostering further merging until a few great co-operatives are organized. Mergers, after all, are fundamentally the co-operative idea in many respects but in corporate form and with more centralized control.

One Merger Calls for Another—When the chain systems got well under way they began, of course, to bring great pressure on the other groups, reaching back through the wholesaler, the jobber, and the manufacturer. The chains became very strong bargaining agencies and were in a position to buy in quantity and desired, so far as possible, to deal directly with the producers.



Note the decline since 1914 in the number of establishments producing food and how the curve of value of products continues to go up

They began to absorb a certain part of the functions of the wholesaler and jobber and more and more to purchase their goods at the source. As buyers they were in a very strong position and soon many of the small manufacturers began to feel that they were in a weak position, as sellers, to such large buying organizations. This has started another system of mergers; namely, of processors and manufacturers of food products, in part to strengthen their position as sellers and in part to improve the efficiency of production and wholesale distribution.

As the manufacturers and processors have tended to merge they also have absorbed some of the functions of the jobber and wholesaler. In many cases we find that, between the large chain store systems on the one hand and the large organized producing systems on the

other, they have largely absorbed the jobbing and wholesaling functions.

What Economies Have Resulted—Naturally, the primary reason for mergers or consolidations of producers, retailers or manufacturers has been for the purpose of making money. In most cases apparently they expect to make more money, not by raising prices but rather by introducing efficiency and eliminating waste and unnecessary services. They hope in this way to gain an advantage over their competitors and to increase the margin of profit which they can command in a competitive field.

Economies Claimed for Mergers—Mergers of producers or manufacturers fall into two classes: mergers of similar plants such as a series of bakeries, or of a number of non-competitive lines, such as General Foods. The gains that are most obvious in a merger of the first class are: (1) Introduction of technology and machinery, and ability to produce a standardized product; (2) wider knowledge of markets for raw materials and finished products, and (3) reduction of certain costs in distribution.

Introducing Technology—If we go back to housewives in a thousand kitchens, we find little technical knowledge, but they produce bread and cakes by hand labor according to rules gained through long experience. If there is any change in quality of flour or other ingredient, the results are not so good.

The small bakery uses more machinery, but produces its goods largely according to experience and standard formulas. The large bakery, however, introduces the technical laboratory. Raw materials can be assembled from wide sources on the basis of lowest costs and blended to produce a standard product. This ability to produce a standard product, in spite of the varying quality of raw materials, through the use of higher technical knowledge, is of the greatest importance in the case of a national brand, where the consumer expects the same quality from year to year. The same principles hold if we examine the production of any standard food product.

Wider knowledge of markets for raw materials, as well as the finished product, often is an advantage in buying and also enables better adjustment of production to supply and demand.

Warehouse and selling costs appear to be the two largest items of cost in wholesale distribution according to some recent studies by the U. S. Department of Commerce. They account for more than one-half the costs. By eliminating duplication in warehouse, delivery, and sales organizations, the large merger apparently

Growth of Chain Stores of All Sorts
In the Last Eight Years

Average Number of Stores	Grocery	5 and 10 Cent	Wearing Apparel	Drug	Cigar	Shoe	Candy
1920	8,461	1,774	306	409	2,183	284	71
1921	9,267	1,816	348	423	2,224	292	85
1922	11,933	1,844	381	435	2,518	305	102
1923	16,028	2,067	497	534	2,760	345	175
1924	19,019	2,231	616	581	2,797	409	189
1925	22,991	2,387	720	618	3,040	490	219
1926	26,296	2,558	833	724	3,349	553	255
1927	28,521	2,830	986	861	3,439	600	264
1928	29,317	3,057	1,195	1,007	3,543	661	299
December, 1927	29,433	2,944	1,080	936	3,471	625	269
December, 1928	30,324	3,224	1,280	1,111	3,669	690	300

Source: Federal Reserve Board.

Indexes of retail trade by principal classes of chain stores shows that food distribution by chains is outdistancing other lines
(Source, Commerce Reports)

reduces the costs of distribution. Advertising also is introduced by the large producer, although as a rule it is out of the question for the small producer.

Mergers of Non-Competing Products—Mergers of this type also are able to improve technology and use of machinery. Their largest gain probably is through eliminating duplication in warehouse, delivery and sales expense, through the use of joint facilities. Collective advertising can be introduced and be more effective at the same cost. Their bargaining power both as buyers and sellers is strengthened.

Opportunity for the Small Producer—There are thousands of small food processing plants. For the most part they are independent and the question is raised as to whether they would also derive benefit from co-operating on some kind of merger basis. The Census of Manufactures shows that the total number of food manufacturers declined from 68,000 in 1919 to 48,000 in 1925, or approximately 30 per cent in 6 years.

However, in almost every large center are found a number of small coffee roasters, bakeries, ice cream makers, confectionery, macaroni, mayonnaise and many other processors that cater largely to local markets within a radius of 50 or 100 miles. They maintain separate plants, sales forces, delivery service, buying and credit services. There would seem to be ample opportunity for co-operation and use of joint facilities in the local field, as well as in the national field.

The national distributor specializes in a standard product for wide distribution, but the local producer often has a place in catering to special local needs. Large units are not necessary, however, to efficient distribution, but the independent producer or distributor must keep up his efficiency with the trend of the times if he is to hold his place.

Technical experts and advertising agencies also have an interest in what is taking place. Mergers generally call for new and better machinery, and the services of better trained engineers and new operating plans, laboratories and technical experts and new advertising layouts. New developments are taking place rapidly, and it behooves everyone either directly or otherwise interested to keep in close touch with the situation.

Food for Thought

. . . Figures for the . . .
Nation's Major Industry

By V. H. PELZ
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THE focal point of the food industry is the meal, whether it be eaten in the home or elsewhere. Back of the meal lies an intricate and far-reaching industrial organization of a complexity that few of us ever realize. It is vast and intricate in at least four ways: In the number of products which it makes available as alternative constituents of our three meals—or more—a day; in the number and variety of the outlets from which we procure our food; in the number of people who are directly concerned with supplying of food products or food service; and in the total volume of business transacted.

A typical wholesale grocery warehouse will carry between 1,400 and 2,000 items; a typical retail store of the kind which does a widespread delivery business will have 500 to 1,000 items, including brands and sizes, on its shelves, from which the housewife may choose. As for meats, a standard packing-house price list specifies over 100 items. A current market report on the New York fresh fish market lists 24 varieties now being received. Of fresh fruits and vegetables there are a total of over 50 which enter into the government records of domestically grown or imported varieties. These figures do not include the numerous specialty articles made available by many delicatessen shops, bakeries, and dairy product stores.

Consider next the increasing variety of outlets through which we procure our food. One of the amazing facts brought out by the census of distribution for eleven cities was the wide range of retail stores handling food products. We may not be surprised to be able to purchase bakery goods in candy stores, or vice versa, but it is somewhat more of a shock to find that a considerable number of restaurants in these cities did a definite grocery business and that an equal number of drygoods and notions stores sold ice cream, soft drinks, and candy.

Until a census of distribution is taken for the entire country all figures on the number of outlets are estimates only, and they vary widely. The best estimates available indicate that in the United States, there are in round numbers, the following food outlets: 60,000 chain grocery stores; 300,000 independent grocery stores, of which approximately 60,000 are organized in voluntary chains; 125,000 meat and fish shops, both independent and chain; 23,000 retail bakery stores; 70,000 cigar and tobacco stores, most of which sell candy and chewing gum, and many sell other food products; 91,000 soda fountains, including 46,000 drug stores with soda fountains, many of which serve other food products, ranging from sandwiches to table d'hôte dinners; 25,000 stores selling primarily fruit and vegetables; 130,000 general stores, which in many cases sell a limited line of groceries; 110,000 restaurants; 25,000 hotel dining rooms; 7,200 hospitals; 4,200 clubs; 11,000 school and industrial cafeterias; 6,600 institutions (prisons, charitable, etc.); 33,000 miscellaneous outlets, such as railroad camps, construction camps, wayside stands that serve meals, and railroad dining cars. There are also an unknown number of retail stores selling dairy products, and nobody knows how many wayside refreshment stands and automatic vending machines for food products of one kind or another.*

In this day of extreme specialization it is a very common thing to distinguish between our interests as "consumers" and our interests as "producers." Here again is illustrated the complex and widespread character of the food industry, for it may be safely said that at least 30 per cent of the entire population gainfully employed in some way has a part in the raising, manufacturing, selling, or serving of food. When Congress takes a hand in the food business, through Farm Relief, the tariff, the Packers' Consent Decree, price maintenance legislation, licensing of commission merchants, or otherwise, we should not shrug our shoulders and think these matters the concern only of food "producers," for approximately one person out of three of all those working for pay are engaged, directly or indirectly, in the "food" business.

Consider first the fact that in 1920 there were 10,735,780 persons, or 25.8 per cent of the total gainfully employed population, engaged in farming and fishing, and that "foodstuffs" constitute seven-eighths of the total production of agricultural products; and next consider that the food manufacturing activities in 1927 involved a total of 49,445 establishments and that 850,172 persons were employed.

Figures on the number of people engaged in the distribution of food products are exceedingly unsatisfactory, and will remain so until a census of distribution is available for the whole country. The census of 1920 gives only the sketchiest sort of information as to the number of persons engaged in distribution of food products. To begin with, there was a total of 719,826 dealers in foodstuffs—chiefly retailers. In addition, it is estimated, on the basis of figures and proportions in the census of distribution for eleven cities, that in 1920 at

*All these figures are taken from sources considered most reliable, for there are wide variations in various estimates available, few of which coincide with census figures cited later for the purpose of estimating the total number of persons engaged in producing and distributing food..

least 300,000 more persons, employed as clerks, laborers, porters, sales people, and the like, were carrying on these occupations in retail establishments which dealt in food. At least another 900,000 persons are directly interested in the food business as hotel and restaurant keepers, cooks, waiters, and the like.

There are known to be over 3,000 food brokerage firms in the United States; over 6,300 wholesale grocers; some 3,800 wholesale produce firms; and 3,200 wholesale confectioners. Each of these firms, of course, has employees but the total number of them is unknown. Still other additions must be made for an unknown number of sales people in drug stores, soda fountains, cigar stores, and other outlets that sell food products secondarily, and also for wayside stand operators and for railroad dining-car employees.

Nor is any industry as important as food in the matter of sheer volume of business transacted, although here again estimates vary widely. One large chain store organization estimates the total annual retail sales of food, including meals outside the home, at over $15,500,000,000. The marketing division of two publishers estimates that the total amount of food consumed yearly, including that eaten outside the home, amounts to something over $23,000,000,000 in one case, and $28,683,000,000 in the other. Further evidence of the importance of food is indicated by the fact that the census of distribution for eleven cities shows that 28.51 per cent of all retail sales are for food.

Among manufactured products those of food and kindred lines easily top all major groups with production value in 1927 at $10,835,547,136. To this must be added at least two other sums to get at the total estimate of the value of food products *before* they enter wholesale and retail channels of distribution; i.e., the value of fisheries calculated in 1927 to be over $100,000,000; fresh fruits and vegetables valued at about $1,400,000,000 in 1927; poultry products valued at approximately $1,200,000,000; and all fresh or market milk, the value of which approximates another billion dollars annually.

With such magnitude and complexity it is no wonder that the food industry looks with concern at the problems facing it—problems of production, both agricultural and industrial; of distribution, of adjustment of output to consumption, of straightening out of chaotic and tortuous channels and relationships. But if prophecy is permissible, these complications will be met by a determined attempt to simplify the commercial relationships that hold the vast structure together, to the end that the "commercial revolution" which seems just to be starting may work itself out through the application of equally profound engineering principles to a conclusion as satisfactory, both to producers and consumers, as did the "industrial revolution" of a century ago.

Applying Marketing Knowledge

Gained at Louisville

By Wroe Alderson

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When the suggestion was made in Louisville that a retailer could not reasonably hope to succeed if he carried unsalable merchandise, a murmur of dissent arose from some of the manufacturers present. They believed that if such a strict and critical attitude was encouraged on the part of the retail grocer there would be no means for the new and improved product to find its market and to develop a demand.

There need be no fear on this score. Progressive merchants are always giving the new item a trial. The point is, that they give it a trial and not a permanent pension. An item of character and quality is entitled to be shown so that the consumer may become acquainted with it. But if it does not presently begin to produce profitable sales there is no reason why the retail grocer should subsidize its meager sales until it has had years in which to establish itself. A new item should be given its chance, and when it proves incapable of reacting favorably to this spirit it should be placed on a bargain counter and cleared out as rapidly as possible.

Furthermore, it is not so much the readiness with which he experiments with the new item that overloads the shelves of the retail grocer. It is, rather, his reluctance to discard the antiquated product that frequently should be displaced by an improved commodity. The human body does not grow merely by building new cells, but by disposing of dead tissue also. If a grocery store is to be kept alive and healthy there must be excretion as well as accretion.

Three of the most significant factors in better retailing concerning which we are already able to speak very definitely are those of pricing, service policies, and store arrangement. The first principle of proper pricing in a retail store is that a proper price is a profitable price. Too many lines are being carried at a price only slightly above their cost to the merchant, because he feels that his customers cannot do without them and would resent being asked to pay their true price. It has long been considered good business to actually sell at a loss many fast-moving commodities in the hope that the loss could be made up from longer-range items sold to the same customers. Chain stores and other aggressive merchandisers have used certain commodities as leaders, cutting the price to or below actual cost merely as a form of advertising.

It is beginning to appear that this may be one of the

more expensive forms of advertising for everybody involved. Certainly the manufacturer is finding a decided disadvantage in having his product chosen to be sold at a sacrifice. Such a practice inevitably creates bad feeling among the merchants who do not feel that they can meet such prices. For the independent retailer it is a dangerous practice because it is difficult to control and difficult to estimate the actual effect of such an expedient. Because a store is giving a specially good price on an individual item by no means assures the merchant of receiving the remainder of a customer's trade.

PRICES should be prominently displayed. If price tags do not appear on merchandise in grocery stores the customer unconsciously assumes that there is something wrong with them. The store that successfully features prices is not necessarily one with consistantly low prices but one that has the knack of featuring the bargains it does provide. A young merchant in Louisville came to the survey offices and told a pathetic tale of continuing loss and discouragement. He was sure that his whole trouble lay in being undersold by the chain stores.

An actual examination of his prices indicated that he was underselling his chain store competitor on many items. The real difference in the two stores was the price emphasis and publicity featured by the chain. Every item in the chain store bore a tag—no such item was used in the independent store. There were signs in the chain store window featuring the leading prices for the week —no such advertising appeared in the other store.

Some merchants are too willing to grant any request on the part of the customer. Credit and delivery are definite services for which the merchant should be paid as definitely as possible. Several satisfactory systems have been worked out by which the customer may receive special advantages if his credit and delivery demands are not exorbitant. The average merchant does not feel that he could charge his customers for delivery, yet direct charges are being used by both chain and leading independents. One chain store group is making all deliveries of over $5 free and charging 10 cents to deliver an order of less than $5. If it does not seem practicable to make such a charge the merchant can at least keep his delivery within reasonable bounds. He should set up for himself a section of the city within which he finds it profitable to make deliveries and never go beyond it. Probably no retailer can conduct a profitable delivery business if he attempts to answer every call no matter from what section of the city.

KEEP credit within bounds. Sell it as a service! Do not give it away as a temptation to carry merchandise away from the store. A sale has not actually made you any money until the cash is in the till. A little forethought and investigation at the time a customer applies for credit will save hours of vain regret after futile attempts at collections. Do not allow a cash customer to automatically become a credit customer without investigating his credit standing. Most cities now have very efficient credit bureaus for the use of the retailer. The credit survey at Louisville indicated a very much stronger proportion of collections on the part of those stores which used the credit bureau service.

The retailer has the opportunity of performing an additional service for both manufacturer and consumer. It is a function to perform this service but it is mainly being done carelessly or half-heartedly. This is the service of informing the customer concerning the point of excellence of the new or improved product. Having been sold by a salesman representing a wholesaler or manufacturer on the merits of a commodity, the retailer typically puts the commodity on his shelf and waits for it to sell itself. He cannot leave everything to the manufacturer's advertising. Many customers are eager to know about the new product and its advantages. The retailer needs merely to pass on to his customers the point or advantage which the salesman used in convincing him.

The most definitely tested advantage in better merchandising principles is that of proper store arrangement. In order to survive a retail store must now be pleasing in appearance and atmosphere. It must be efficient as to display and for assembling orders. This means access to the merchandise for both customer and clerk. They must be able to see it and to lay hands on it quickly.

The Federal Trade Commission And the Chain Store

The Federal Trade Commission's investigation of chain store business is a masterpiece among government fact-finding activities. Carried on almost wholly by correspondence, the inquiry comprehends not only the chain stores' own business but that of the wholesalers and independent retailers. If the Commission were able to garner all the information that its questionnaires are intended to produce it would be able to present to Congress a report that would answer every what, where, when, why and how regarding the chain store and its competitive impact upon the business community.

Nothing could be more comprehensive than the 22-page questionnaire that has just been directed to some 50,000 retail dealers. Many merchants may pretend to know all about their own business but there are many more who will rub their eyes when they glance through the schedule that has been prepared for them. It would be aptly described as a statistical marathon.

Consumer, Not the Goods, the Raw Material Of Distribution

(Continued from page 3)

in life is there any human power without a corresponding responsibility. Those who use, or even possess, mass-buying power must recognize their responsibility to him who comes into natural contact with that power—the manufacturer. The greater the power, the greater the responsibility—and that responsibility is threefold. The possessor of mass-buying power is responsible to the manufacturer in sustaining the manufacturer's fair return—fair profit. And through the manufacturer, the mass buyer is responsible to the consumer in sustaining the integrity and quality of the manufacturer's goods; and to labor in upholding the decent and economically sound standards of work and wages which the manufacturer has developed.

Up to a certain point intensified competition in distribution forces sound economies in production; beyond that point, economies may become dangerously unsound. No mass buyer can for long ignore these responsibilities without undermining that prosperity upon which his own prosperity depends. Here, indeed, is a new and profoundly stirring meaning to those old words, "Let the buyer beware!"